

3-25-2016

Disinhibition, Violence Exposure, and Delinquency: A Test of How Self-Control Affects the Impact of Exposure to Violence

Wyatt Brown

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Disinhibition, Violence Exposure, and Delinquency:
A Test of How Self-Control Affects the Impact of Exposure to Violence

by

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A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
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Date of Approval:
March 24, 2016

Keywords: Antisocial, Interaction, Juvenile, Moderation

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DEDICATION

I dedicate this dissertation in loving memory of my sister, Julieanna Anastasia Baggett, whose life was short but had an everlasting impact on all who knew her. As a mother, sister, wife, and friend, she wore many titles and truly epitomized the life of a genuine southern lady. The dedication and commitment she put towards all of her endeavors is a trait I strive to achieve in my life, and a characteristic all who knew her benefited from tremendously. Julieanna was loving, kind, generous, and supportive to myself and many others. These traits and the love Julieanna emulated are those the world needs more of. She will be missed but her influence will endure.

I would also like to thank my father, Joseph Brown and late mother, Tracy Brown for their unwavering support. My siblings, Jonathan and Heather Brown encouraged me throughout my life and academic endeavors, and I am incredibly thankful for them.

I must also give a special thanks to my fiancée, Elisa Toman. Her love and support have made this arduous process much less difficult. Finally, I am grateful for our dogs, Heidi, Henny, and Koda, who have provided never ending comfort and comedic relief.

ACKNOWLEDGMENTS

I would like to thank Dr. Jones and Dr. Jennings for providing guidance and encouragement throughout the development of this dissertation. I would like to thank Dr. Cochran for his mentoring and guidance. I must also acknowledge and thank Dr. Higgins who believed in me enough to encourage me to apply to doctoral programs. Lastly, I would like to express my appreciation for the research opportunities and professional guidance provided to me by Dr. John Cochran, Dr. Michael Lynch and Dr. Max Bromley. Your support and mentorship has been, and continues to be, invaluable.

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ABSTRACT

This dissertation examines the role of self-control in the relationship between exposure to violence and antisocial behavior. Specifically, this study proposes that the impact of exposure to violence changes depending on internalized factors such as self-control. Individuals with high exposure to violence but greater levels of self-control may be less influenced by the impact of exposure to violence. Conversely, individuals with low levels of exposure to violence and lower levels of self-control may be more influenced by the impact of violence. The findings from this study suggest that there is some buffering effect on the impact of exposure to violence which may be explained by levels of self-control. This finding is consistent with prior research which finds that the impact of environmental factors on crime and analogous behaviors can be influenced by other personal traits. The results of this study provide researchers and practitioners with important information regarding the impact of exposure to violence on antisocial behavior and the influence self-control has on this relationship. Due to the fickle nature of human behavior and the preciseness involved in developing treatment or diversion plans the relationship between environmental and internal factors should be addressed.

CHAPTER ONE INTRODUCTION

Considered a worldwide public health problem, exposure to violence perpetuates aggressive and violent behavior in children and adolescents (WHO, 2010). Studies on the topic of exposure to violence are still mounting, but virtually all published research finds a relationship between exposure to violence and subsequent aggression among youths (Kaya, Bilgin, & Singer, 2011). Both witnessing violence and being victimized has shown to increase the risk of aggressive behavior during childhood, adolescence, and further into adulthood (Flannery, Western, & Singer, 2004). Individuals who are exposed to both witnessing and being victim of violence are most prone to future aggressive behavior (Moylan et al. 2009). Exposure to violence has a major influence on human behavior. Much of the research focused on exposure to violence is grounded in learning theory. That is, violence is learned from witnessing or being victim to violence. Because of the strong relationship between observing violence and antisocial behavior, more research is needed to understand how exposure to violence may be a cause for subsequent antisocial behavior.

In the United States, exposure to violence is a serious problem, which disproportionately affects disadvantaged communities. Youths who reside in strenuous societal situations or less than desirable living conditions are at a greater risk to be exposed to factors which may increase the likelihood of antisocial behavior when

compared to people who reside in more affluent neighborhoods. One reason for this increased risk is that individuals born into these harsh conditions are more likely to witness violence. More than 70% of children in low income communities are exposed to violent behavior (i.e., domestic violence, assaults, arrests, drug deals, gang violence and shootings; Skybo, 2005; Margolin & Gordis, 2004). Exposure to violence during childhood may be more detrimental because children may have not developed the necessary coping skills to appropriately deal with violent behavior. The effect of violence exposure could result in behavioral problems, which can vary from mild psychological stress to violent behavioral outcomes.

Several theories suggest that exposure to violence can increase the risk of antisocial behavior. Traditionally there are numerous areas of research which encompass studying exposure of violence. Often, researchers tend to focus on community level exposure to violence (Garbarino, 1995; Garbarino, Dubrow, Kostelny & Pardo, 1992), exposure to domestic violence (Fantuzzo, et al., 1997; Jaffe, Wolfe & Wilson, 1990), and direct victimization such as physical abuse (Kaplan, Pelcovitz, & Labruna, 1999). Many of these studies have shown that urban youths who witness violent crimes such as shootings, homicides, and robberies have a tendency to be more aggressive and exhibit more violent behavior than children who are not exposed to violence (Gorman-Smith & Tolan, 1998; Osofsky, Wevers, Hann, & Fick, 1993). From an individual social learning perspective, continuous exposure to violence may increase the likelihood of fostering legitimacy in violent acts. For example, a child may learn to imitate violent behavior by being constantly exposed to violence (e.g. Bandura, 1973).

Other factors are grounded in epidemiological research which suggests exposure to violence can also lead to mental health issues, such as depression and post-traumatic stress disorder (Cisler et al., 2012; Zona & Milan, 2011). Suffering from these mental health problems may make it difficult to achieve desirable living conditions and/or desirable work. These adverse consequences of exposure to violence have led some researchers to conclude that exposure to violence perpetuates a cycle of violence.

Kaufman and Zigler (1987) found support for the cycle of violence hypothesis, concluding that childhood abuse or neglect increased the risk of being arrested for violent crime. In a more recent longitudinal study, Widom (1998) also supported the idea that exposure to violence creates violence, finding that experiencing violence as a child increased the likelihood of being arrested for a violent crime by 21% as a juvenile or adult. A recent study utilizing a sample of violent delinquent youths suggests that environmental stressors such as exposure to violence can perpetuate the cycle of violence by impacting the development of self-regulatory capacities and future-orientation (Monahan et al., 2015). Specifically, this study concluded that exposure to violence during early adolescence and into adulthood lowered one's perceived future-orientation but was unrelated to self-regulation. The authors proposed that the lack of influence on self-regulation was likely due to an individual's level of self-control being established prior to adulthood.

Although some individuals may be more at-risk, many youths who are exposed to violence do not become violent (Widom, 1998). Several researchers have also illustrated that not all individuals who are exposed to violence will have behavioral

problems (Egeland, Jacobvitz, & Sroufe, 1984; Hunter & Kilstrom, 1979; Herrenkohl, Herrenkohl, & Toedter, 1983). The reason for this discrepancy is debated, but some scholars advocate that individual-level factors may have some influence on whether antisocial outcomes are manifested (Margolin & Gordis, 2004).

Exposure to violence has a unique individual effect and as suggested, the impact of exposure to violence may be contingent on other internalized factors. For example, Caspi and colleagues (2002) examined exposure to violence and found that childhood maltreatment predicted antisocial behavior only when specific genetic factors were also present. Also the impact of other criminological constructs may be moderated by internalized factors. Thus, the negative impact of delinquent peers is more pronounced among disinhibited individuals (Vitulano et al., 2010). However, no previous study has considered whether the impact of exposure to violence on antisocial behavior is moderated by individual-level variables such as disinhibition.

As mentioned, there is little research on the relationship exposure to violence has with various internalizing factors. As Caspi and colleagues (2002) discovered, genetic risk factors play a role in determining the effect of childhood maltreatment, similarly, influences such as the ability to control impulsive behavior may influence the relationship exposure to violence has with antisocial behavior. One aspect that has been shown to moderate the relationship between several criminological constructs and antisocial behavior is self-control. Several studies have revealed that self-control is not only a robust correlate of offending and antisocial behavior, but also interacts with other constructs, which also correlate with antisocial behavior. Lynam and colleagues

(2000) found that the effect of deplorable neighborhoods on antisocial behavior was stronger among adolescent boys who had less impulse control. Furthermore, Wright and colleagues (2001) have noted that, those higher in self-control appeared to be less influenced by other criminogenic factors (e.g., antisocial peers). Individuals' level of self-control will likely vary among those who are exposed to violence, and their level of self-control may influence the effect of the exposure on the outcome of antisocial behavior.

Although there is a substantial literature which suggests exposure to violence leads to violence, not all individuals exposed to violence fulfill this prophecy. The findings from this dissertation will help determine why some individuals who are exposed to violence do not act on their predisposition. Innately, this will identify characteristics which may contribute to an individual's risk of antisocial behavior. This determination can guide treatments and interventions, which could be focused on individuals who are at a greater risk for criminal behavior. Identifying offenders who may be more at-risk is important. Due to today's political economy, resources are limited, especially for treatment programs directed at offenders. This makes it imperative that researchers are able to determine which individuals may be more at-risk for antisocial behavior, and practitioners should focus the majority of their limited resources to address those individuals (Bonta & Andrews, 2007). This would ultimately reduce criminal justice costs and in the long term reduce crime.

Accordingly, there are several questions that will be addressed in this dissertation. First, is there a relationship between having been exposed to violence and

subsequent offending among a sample of arrested juvenile offenders? Due to the limitations of studying an offender population there has not been a great deal of research that addresses this question. On the one hand, it could be that such individuals possess such elevated levels of propensity that exposure to violence will have a limited effect. On the other hand, exposure to violence might be such a powerful correlate that even among an at-risk sample it exerts substantial effects. The second component addresses the relationship between self-control and subsequent antisocial behavior. The majority of the studies that assess the effects of self-control do not utilize an offender sample and examine the self-control offending relationship cross-sectionally. The current study utilizes a sample of youths convicted of serious offenses, which represents a population with high levels of exposure to violence, poverty, mental illness, dysfunctional families, and deplorable neighborhoods (Reingle et al., 2011; Chung & Steinberg, 2008; Mulvey et al., 2010; Tolan, Gorman-Smith, & Henry, 2003). Therefore the results of the study are not generalizable to the population, but can prove useful in detecting individual variation in exposure to violence, self-control, and antisocial behavior given that these factors should be more prevalent. Due to the ethnic disparities among the correlates of crime, for example exposure to violence, these factors could be considered during sentencing or in developing treatment plans for individuals convicted of a crime or considered crime prone. The current study also utilizes a longitudinal design, which is optimal for studying human behavior. Conversely, some research suggests that constructs such as self-control may have weaker effects in longitudinal studies (Pratt & Cullen, 2000). Given that the current

study is longitudinal it may contribute to that debate. The last question focuses on the moderating potential of self-control in decomposing the relationship between exposure to violence and subsequent violence. Much of the research on exposure to violence suggests that there is a circular relationship between being exposed to violence and violent behavior, which is referred to as the cycle of violence. This research question uncovers whether self-control moderates the relationship between exposure to violence and violent antisocial behavior.

Research questions

Question 1. Is there a relationship between exposure to violence and antisocial behavior within a sample of serious and violent juvenile offenders?

Question 2. Is there a relationship between exposure to violence and violent antisocial behavior within a sample of serious and violent juvenile offenders?

Question 3. Is the relationship between exposure to violence and antisocial behavior affected by one's level of self-control?

Question 4. Is the relationship between exposure to violence and violent antisocial behavior affected by one's level of self-control?

Conclusion

Violence is a serious issue in the United States and the consequences are deplorable. Furthermore, this problem is disproportionately affecting lower-class populations. The established relationship between exposure to violence and antisocial behavior suggests there could be grounds for a causal relationship. One goal of the current research is to unearth how the relationship between exposure to violence and

antisocial behavior is affected by one's level of self-control. Specifically, this dissertation explores the relationship between exposure to violence, levels of self-control, and antisocial behavior in a sample of serious adolescent delinquents. This dissertation goes further than previous research by exploring the relationship between exposure to violence, levels of self-control, and violent antisocial behavior. The results of this study will provide researchers and practitioners with essential information regarding how exposure to violence affects antisocial behavior, as well as the role (if any) levels of self-control have in determining this relationship.

In an effort to thoroughly explain the relationship between antisocial behavior, exposure to violence, and self-control, the subsequent chapters are presented as follows. Chapter two provides the theoretical background and a review of the literature related to the relationship between aggression and exposure to violence, levels of self-control and offending, self-control as a moderator for other criminal constructs, and concludes with a justification for the current study. The third chapter presents the methodology and research design for the current study, which includes a description of the data, variables selected, variable justification, and the analytical plan. The fourth and fifth chapters present the findings and results, followed by discussion, implications and conclusions, respectively.

CHAPTER TWO LITERATURE REVIEW

The relevant literature to the current study is organized in the following sections. First, this chapter will begin with an examination of the relationship between exposure to violence and antisocial behavior. Second, a discussion and explanation of self-control, and a brief review of literature that supports its connection to antisocial behavior is presented. Third, this chapter presents studies, which have proposed that self-control is a moderator for various criminological constructs. The fourth section discusses prior research which has suggested that there are enhancing or buffering factors which influence the relationship between exposure to violence and antisocial behavior. Fifth, this chapter presents essential studies that provide justification for the current study and discusses how self-control may act as a moderator between exposure to violence and antisocial behavior.

Exposure to violence and links to antisocial behavior

Theoretically, exposure to violence can lead to aggression, which may ultimately result in antisocial behavior. Theories of how exposure to violence relates to aggression have been developed by Bandura (1973), Berkowitz (1974), Eron, Walder, and Lefkowitz (1971), Lorenz (1966) and many others. Presented next is a discussion of these various theoretical approaches to aggressive and antisocial behavior followed by studies which support the theoretical position.

Learning theory

Bandura's approach to human behavior is derived from a social learning perspective, suggesting that antisocial behavior is a consequence of exposure to violence through transference. Transference occurs when a certain behavior is observed and an individual mirrors the same behavior when they are confronted with a similar situation. This approach differs from the normal behavioral conditioning approaches in that an individual's observations become the main source of learning. Bandura further proposes that much of human behavior is learned from other humans rather than through just trial and error. He found support for his proposition through famous experiments which utilized dolls. Prior to being presented with a doll, children observed how others handled the doll. Once the children were presented with a doll, Bandura discovered that children would behave in a similar manner toward the doll as they had observed of others. The idea of transference is essential to the understanding of how antisocial behavior is derived from exposure to violence. As a child grows and develops, witnessing violence could perpetuate the transference of violent behavior simply through observing it.

There is evidence to support Bandura's approach in that exposure to violence during childhood plays a role in later violence. Both females and males who are exposed to a high-level of domestic violence during rearing are likely to be more antisocial than those who are raised in a low-level domestic violence situation (Flannery et al., 1998). After controlling for familial and demographic factors, childhood maltreatment was found to predict violent behavior in a longitudinal study of urban

males (Stouthamer-Loeber, Wei, Homish, & Loeber, 2002). Research further suggests that child maltreatment may result in not only behavioral problems, but also depression and self-esteem issues (Lynch & Cicchetti, 1998). Many social learning models suggest that exposure to aggression as a child leads to later childhood aggression and other conduct problems (Patterson, Reid, & Dishion, 1992). Two longitudinal studies found a relationship between parental abusive/neglectful parenting and childhood aggression, but the severity of the exposure was not considered (Aber et al., 1989; Erickson, Egeland, & Pianta, 1989). Much of the literature suggests that exposure to violence at an early age can increase risk of future violent offending. Theories suggest antisocial behavior can be learned or transferred from exposure to violence, and a better understanding of factors which may influence the relationship between exposure to violence and antisocial behavior is needed.

Research differentiating between witnessing community violence versus the effect of witnessing domestic violence have found that similarities exist. Individuals in both situations have a unique increased risk for antisocial behavior, but the combination of the two scenarios, which often exists, is the most likely medium for violent behavioral outcomes (Eitle & Turner, 2002). In a representative sample of nearly 6,000 6th-9th graders, Eitle and Turner (2002) found that exposure to community violence combined with a history of receiving traumatic news, victimization, and association with delinquent peers, increased the likelihood of delinquency. They further concluded that exposure to adversities (e.g., witnessing community violence, witnessing domestic violence, receiving traumatic news, domestic abuse victimization, other violent

victimization, and accidents) increases the risk of crime. This study is unique given that the majority of literature on the effects of exposure to violence utilizes an at-risk population or samples from crime prone neighborhoods. Their study used a sample which could arguably be more descriptive of the general population.

Spaccarelli and colleagues (1995) utilized a sample of 213 adolescent males and included the severity of exposure to violence. They divided participants into four groups: “violent offenders,” “undetected violent offenders,” “violent deniers,” and “control.” Both undetected and detected violent offenders had higher rates of exposure to violence than the other two groups. Furthermore, exposure to violence was related to lower self-reported competency, positive attitudes toward aggression, and use of aggression as a coping strategy. Overall, there are many consequences to violence exposure, including aggressive behavior.

Utilizing a sample of college students from South Korean and the United States, Gover and colleagues (2011) examined factors which could lead to relationship violence. These factors included childhood maltreatment, low self-control, and intimate partner violence. The findings indicated that childhood maltreatment and exhibiting low self-control predicted both the perpetration and victimization for psychological and physical relationship violence. This coincides with the current study, which suggests that predictors of antisocial behavior such as exposure to violence may be affected by internalized factors such as self-control.

Eron and colleagues (1971) continue in a similar style as Bandura, suggesting that children learn not only from other humans but can learn through other mediums as

well. They suggest that viewers, especially children, can learn of violence and aggression by observing it on television programs. The authors go on to suggest that not only are these behaviors learned, but they also dictate the level of aggression at an early age. This aggression level appears to be static throughout the life course. The study suggests that an individual's aggressiveness is established early during life, and similar patterns of aggressive behaviors persist over the life-course.

Exposure to violence affects both current and future behavior. A study of Chicago adolescents found that exposure to gun violence is associated with a doubling in the likelihood that the exposed adolescent will commit a violent crime (Bingenheimer, Brennan, & Earls, 2005). In this study, exposure to gun violence had a direct relationship with future violent offending. This suggests the severity of exposure to violence (exposure to gun violence rather than something lesser such as a domestic dispute) may have a greater impact on the likelihood of offending.

Behavioral theory

Although criticized greatly, Lorenz (1966) proposed a very different perspective, which is reminiscent of the Hobbesian approach to human behavior. Both Hobbes (1651 [1969 edition]) and Lorenz suggest that humans are instinctually aggressive. Similarly, Tremblay (2003) suggests that aggression is normal behavior and humans have to be socialized to avoid aggressive behavior. Lorenz goes a bit further by proposing that humans are more aggressive than animals. Lorenz argues that ritualistic behaviors among animals help alleviate provocative situations. By carrying out these ritualistic actions, animals are able to expend their aggression in a more acceptable manner rather

than resorting to violence. He further presents the argument that humans do not have these rituals, and they have greater intelligence and more technology, which could yield more violent outcomes than any other anthropoid. Furthermore, aggression in humans is an impulsive behavior utilized for self-preservation. That is, aggression is an essential element for the survival of both humans and animals. As mentioned, this instinctual approach is heavily criticized by behavioral scientist who highlight the tautological argument that Lorenz presents (Lefkowitz et al., 2013). The basis of the argument being that aggressive behavior is identified as being caused by innate aggressiveness. Thus, aggressive behavior is caused by aggressiveness, which is then identified by aggressive behavior. Furthermore, labeling aggressive tendencies as instinctual suggests that there is some genetic trait which controls the level of aggression. To date, there is little consistent evidence that suggests equal hereditary transference of aggression (Lefkowitz et al., 2013).

Social and biological approaches

Although social and biological approaches to explaining behavior are in competition, some researchers have found that there is an interaction between environmental and biological factors which may result in aggressive behavior. For example, an individual who is raised in a desirable condition, but has a genetic predisposition toward aggression, may not be any more aggressive than someone without the genetic risk, raised in undesirable conditions. The most aggressive individuals would be those who have a genetic susceptibility and are in difficult societal conditions. Similarly, Caspi and colleagues (2002) found support for this idea,

concluding both childhood maltreatment and genetics interact to influence antisocial outcomes. Other studies have supported this idea, suggesting that there must be an environmental trigger for the genetic predisposition to manifest itself (Plomin, Nitz, & Rowe, 1990; Moffitt, 1993; Rutter, 2000). For individuals with internalized risk factors, such as genetic risk, exposure to violence may trigger aggressive outcomes if proper coping skills are not developed.

A final theoretical approach as to how exposure to violence may illicit antisocial behavior comes from Berkowitz (1974), who suggested antisocial behavior – specifically aggression – is the result of impulsive tendencies. Moreover, certain cognitive capacities are needed to suppress the impulse to commit antisocial behavior. That is, aggressive behavior is the product of both the impulsive predisposition and presence of aggravating stimuli (i.e., foul odors, unpleasantly high temperatures, and frightening information). Put differently, aggressive behavior is the result of an impulsive individual in an environment with stimulating cues. This approach is vastly different from the perspectives noted above, and instead suggests that internalized factors are largely related to antisocial behavior. Berkowitz (1974) also notes that antisocial behavior is an advanced human behavior, which may be influenced by many factors.

Though there are several theories on the origins of antisocial behavior, summarized above are three different approaches that focus on how antisocial behavior or aggressive behavior is derived. The first approach was that of a social learning perspective. This perspective proposed that behavior is learned from witnessing the behavior of others, whether first-hand and in person or through media. The second

approach was instinctual, which suggests that humans are innately aggressive. The final theoretical approach suggested that both situational factors and disinhibition influence antisocial behavior. That is, an impulsive person exposed to specific stimuli may react aggressively.

As mentioned before, the bulk of studies looking at exposure to violence support the idea that a relationship exists between exposure to violence and antisocial behavior, although the majority of individuals exposed to violence may not develop any problems. For example, in an early meta-analysis, Kaufman and Zigler (1987) concluded that childhood exposure to violence increases the rate of perpetrating childhood abuse from approximately 5% to 30%, and approximately 70% of children who are exposed to violence do not have antisocial behavior problems as adults. Some studies have noted this resilience and attributed it to social and support structures (Hill & Madhere, 1996; O'Donnell, Schwab-Stone, & Muyeed, 2002). An individual who has protective factors, such as good friends, parents, and schools, are able to buffer the effect of exposure to violence. O'Donnell and colleagues (2002) found parental support to be a powerful predictor of this buffering effect in 6th, 8th, and 10th graders, but it became substantially less important over time. The impact good schools have on reducing the effect of exposure to violence does appear to remain stable over time, especially for individuals with substance abuse problems. Furthermore, support from peers had the weakest impact on this buffering effect. These three different findings suggest that each factor may have a different role. Self-control was not measured in this study, but given

that it theoretically correlates with many of these factors it may also prove to have some resiliency effect.

The studies discussed in this section presented findings which support the argument that antisocial behavior is linked to exposure to violence. Exposure to violence is often a precursor for antisocial behavior. Moreover, findings also suggest that the majority of individuals who are exposed to violence generally do not exhibit antisocial behavior, or at least, do not participate in violent antisocial behavior. In order to address a possible reason for this, the current study proposes that other internalized individual level factors may influence the relationship between antisocial behavior and exposure to violence.

Self-control links to antisocial behavior

Individuals with low self-control have an inability to be deterred from behavior, which may have negative long-term consequences. This lack of control has been referred to in a variety of ways, such as effortful-control (Rothbart, 1989), self-control (Gottfredson & Hirschi, 1990) impulsivity (White et al., 1994), self-restraint (Feldman & Weinberger, 1994), and self-regulation (Barkley, 2004). Although the history of research on self-control or impulse control is vast, the most popular version of self-control in the field of criminology is that found in Gottfredson and Hirschi's (1990) book *A General Theory of Crime*.

Self-control theory

In *A General Theory of Crime*, Gottfredson and Hirschi (1990) review several explanations of antisocial behavior, and conclude that one's level of self-control is the best explanation. They state "...self-control captures the relatively stable tendency to engage in (and avoid) a wide range of criminal, deviant, or reckless acts better than such traditional concepts as criminality, aggression, or conscience," (Hirschi & Gottfredson, 1994, pp. 51-52). Gottfredson and Hirschi (1990) propose that self-control is a superior explanation of antisocial behavior and reiterate that low self-control does not solely determine antisocial outcomes, but rather that lack of self-control increases the probability of antisocial behavior (Hirschi & Gottfredson, 1994).

In essence, self-control theory rests on the basic assumption that those persons who lack self-control tend to pursue their own self-interest without concern for the potential negative long-term consequences of their behavior. Individuals with low self-control favor behavior that results in immediate gratification. These types of activities are often reckless or illegal. Gottfredson and Hirschi (1990) identified those that have low self-control as exhibiting six characteristics, which resemble personality traits (i.e., impulsivity, self-centeredness, risk-seeking, preference for simple tasks, preference for physical activity, and short-temperedness). Self-control has proven to be one of the strongest correlates of antisocial behavior in criminological literature (Pratt & Cullen, 2000), and a large body of literature supports self-control theory (Cochran, Wood, Sellers, Wilkerson, & Chamlin, 1998; DeLisi, Hochstetler, & Murphy, 2003; Gibbs, Giever, & Higgins, 2003; Higgins, 2002; 2004; Higgins & Makin, 2004; Higgins &

Ricketts, 2004; Nagin & Paternoster, 1993; Unnever, Cullen, & Pratt, 2003). Regardless of how empirically supported self-control theory is, however, there is still quite a bit of controversy as to how self-control should be operationalized (Hirschi, 2004).

As originally proposed, one's level of self-control is determined early in life and remains relatively stable throughout the life course. Further, it is argued that levels of self-control are developed from good parenting strategies and good child-rearing practices. Some studies have confirmed the relationship between good parenting practices and greater self-control, which results in less antisocial behavior (Higgins & Boyd, 2008).

Self-control theory has become one of the most prominent criminological theories. Not only does self-control have a direct impact on offending, it may also influence other criminogenic factors. The next section presents research that proposes and supports the proclamation that self-control may influence the relationship between other criminological constructs as they relate to antisocial behavior.

Self-control moderates effects of criminological constructs

Theoretical and empirical accounts suggest that an individual's level of self-control may moderate the relationship between other individual level factors and antisocial behavior. This growing body of literature proposes that self-control may moderate the effects of many well-known and studied criminological constructs. Lynam and colleagues (2000) reported that the effect of neighborhoods on antisocial behavior was stronger among adolescent boys who were more impulsive. That is, the detrimental impact of poorer neighborhoods was more pronounced among individuals

with high levels of impulsivity. In fact, the only scenario in this study in which delinquency increased was when poor neighborhood conditions existed among individuals with high impulsivity. A separate component of this study assessed participants' perceptions of their community. The researchers found that boys who perceived their own neighborhood as bad (i.e., greater levels of incivility) tended to be more impulsive than those who resided in more affluent communities. In this study, neighborhood context interacted with impulsivity, which influenced offending. This study shows that environmental factors can be influenced by individual level traits or that individual level traits can be affected by environmental factors.

Utilizing a relatively large sample (85,301) of 6th-, 8th-, and 11th- graders in Iowa, Meier and colleagues (2008) replicated the findings of the previous study, concluding that the effect of neighborhood contexts on antisocial behavior was moderated by impulsivity. That is, the relationship between impulsivity and delinquency is greater in neighborhoods with low collective efficacy when compared to those neighborhoods with higher collective efficacy. Impulsivity in the study was measured utilizing four items from the UPPS Impulsive Behavior Scale (Whiteside & Lynam, 2001). This study not only supports the findings of Lynam and colleagues (2000), but also adds to it, suggesting that low socioeconomic status increases the risk of antisocial behavior and so does lack of informal social control.

Jones and Lynam (2008) continued this lineage of research testing how perceived informal social control impacted the relationship between impulsivity and offending.

Furthermore, this study looked at various impulsivity-related traits (i.e., lack of

premeditation and sensation seeking). The sample in this study consisted of 1,002 individuals, between the ages of 19 and 21, from the Lexington longitudinal study. The study suggested that sensation seeking and lack of premeditation had significant effects on antisocial behavior among both men and women. Furthermore, the effects of informal social control on offending varied by both sensation seeking (among men only) and lack of premeditation. Specifically, informal social control exerted a stronger effect on delinquency among those lower in these traits. The interaction models in the study suggested that impulsivity and perceptions of informal social control together contribute to antisocial behavior.

Evidence of the relationship between environmental factors and internalized factors suggests that the effects of environmental factors on antisocial behavior can vary depending on an individual's criminal propensity. In a longitudinal study, which utilized data from the Dunedin Multidisciplinary Health and Development, Wright and colleagues (2001) found that pro-social ties (e.g., education, employment, family ties, and partnerships) had a stronger deterrent effect among those lower in self-control when compared to those with more self-control. Furthermore, individuals with low self-control were less likely to experience pro-social ties such as educational attainment, employment, strong family ties, strong partnerships, and individuals with low self-control were also more likely to fraternize with delinquent peers.

This study introduced the idea that social ties are affected by certain internalized traits such as self-control. They further proposed that the presence of pro-social ties can deter antisocial behavior, especially among more crime prone individuals. When this

occurs it is referred to as “social-protection” effect. Conversely, antisocial ties (e.g., delinquent peers) promote antisocial behavior, especially among individuals who already are crime prone. This circumstance is referred to as the “social-amplification” effect. This is a novel theory, which considers enduring criminal propensity may influence the relationship among other factors which are associated with antisocial behavior.

Higgins and Boyd (2008) surveyed 425 college students and found that self-control moderates the relationship between parental support and deviance. They concluded that parental social support can reduce the negative effects of low self-control and ultimately reduce antisocial behavior. The results of similar studies interested in the relationship between self-control and parenting strategies are mixed.

In a study addressing the relationship between parenting, self-control, and antisocial behavior, Jones and colleagues (2007) found that parental support was a stronger inhibitor in reducing antisocial behavior among those with low impulse control. This study utilized a sample of 286 juvenile offenders from the California youth Authority survey. This finding is similar to Wright and colleagues (2001) who also found that parenting played a more important role in adolescents who are lower in self-control.

As noted above, prior research suggests criminogenic environments have stronger influences for some individuals when compared to others. What determines this strength may be internalized factors such as impulsivity or self-control. The literature discussed above supports the notion that environmental factors are influenced

by criminal propensity. In tune with this line of research, it is plausible to anticipate that self-control may affect the relationship between exposure to violence and antisocial behavior. Similar to the social-amplification effect mentioned by Wright and colleagues (2001), exposure to violence might exert a stronger effect on delinquency among those who are lower in self-control. Logically, an individual who was already higher in impulsivity would be more likely to exhibit antisocial behavior regardless to any exposure to violence The next section discusses how the relationship between exposure to violence and antisocial behavior is moderated by other factors.

Exposure to violence moderation/interaction effects

The impact of exposure to violence has been studied extensively across several disciplines. This section reviews literature related to possible moderators that affect the impact of exposure to violence on subsequent violence. These studies range from several fields, including both criminology and psychology. Some of these studies find that the impact of exposure to violence varies depending on other factors, such as type of exposure to violence, peer support, and internalizing factors (i.e., self-esteem). Furthermore, these factors also show some variation across males and females. Additionally, there is evidence to support the notion that internalizing factors such as self-control may influence the impact of being exposed to violence. The following is a review of these studies.

Rosario and colleagues (2003) utilized a sample of 667 sixth-graders, 335 boys and 332 girls, in New York City to test for the buffering effect of coping strategies on the relationship between exposure to violence and delinquency. Specifically, the study

looked at the moderating effect of parental or peer support and behavioral coping strategies. They found that parental support reduced the effect of female victimization on delinquency. Furthermore, peer support reduced the effect of witnessing community violence on delinquency for boys, but it increased the effect of victimization for both boys and girls. Behavioral coping strategies (e.g., a scale which was derived from 33 items identifying strategies used by youths to keep themselves safe, keep bad experiences from reoccurring, or make themselves feel better) reduced the effect of victimization on delinquency for boys, but increased the effect of witnessing violence and delinquency for females.

In a longitudinal study, utilizing a sample of 196 African-American sixth-graders from Chicago, researchers analyzed the relationship between exposure to violence, social support, and anxiety (Hammack et al., 2004). This study specifically looked at protective factors which reduced the effects of exposure to violence. These protective factors were maternal closeness, time spent with family, and daily support structure. Surprisingly, the impact of these factors was eliminated in situations with high levels of victimization. Furthermore, the protective effects were not as strong in situations where there was direct victimization, as opposed to witnessing violence. The effects found in this study did not differ by sex. The results of the study suggests that there is some protective effect of social supports, but their strength changes depending on situational factors.

A study of 515 18 to 22-year-olds tested the relationship between community violence and aggressive behavior, with coping style and perceived social support as

moderators (Scarpa & Haden, 2006). The study found that high disengagement and interpersonal coping styles and low perceived support from friends predicted higher aggression scores. Furthermore, high disengagement and interpersonal coping styles moderated the relationship between exposure to violence and aggression. The study suggested that emotion focused coping styles and perceived support from friends buffer the effects of exposure to violence. Edlynn and colleagues (2008) found a similar relationship with coping skills and the effects of exposure to violence on anxiety. Furthermore, a study of 385 African-American urban children found that familial social support reduced the effect of exposure to violence on anxiety (White et al., 1998).

A study relying on a sample of 263 urban African-American and Latino males explored the role that family function has on exposure to violence (Gorman-Smith, Henry, & Tolan, 2004). The study revealed that poor parenting practices and lower levels of emotional cohesion increase the risk of being exposed to community violence and committing violence. Conversely, those that resided in households with strong functional families were less likely to commit violence, even when exposed to similar levels of violence as those in the disrupted households. This study supports the notion that good parenting practices have a buffering effect on exposure to violence.

Krenichyn and colleagues (2001) tested the effects of parenting role on the relationship between exposure to violence and child distress, post-traumatic stress disorder, and competence. Parenting moderated the effect of exposure to violence on competence. High levels of violence and harsh parenting predicted lower blood

pressure. This study concluded that parent-child relationships may influence stress levels which can affect physiology.

After reviewing decades of literature on exposure to violence, Buka and colleagues (2001) found that ethnic males living in urban areas are at the greatest risk for exposure to violence. Furthermore, they suggest that witnessing violence can lead to higher rates of post-traumatic stress disorder, depression, distress, aggression, and other antisocial behaviors. They offered that strong family support reduced the impact of exposure to violence. They also determined that developmental situational factors can differentiate the effects of being exposed to violence. They concluded that more research is needed in determining what individual level factors can influence the impact of exposure to violence.

In a more recent study Payne and colleagues (2011) conducted a study which examined the relationship of self-control and exposure to violence on offending. This study utilized a telephone survey which could be generalizable to the population but this method may mask relationships given the rarity in occurrence of antisocial behavior. Conversely, using a more general sample rather than an offender-only sample may provide greater variability which could lead to more robust relationships. This more general study found self-control to be equal for those that were and were not exposed to violence. Furthermore, self-control did not explain the link between violence and exposure to violence. Also, low self-control did not appear to result from witnessing domestic violence. They concluded that other factors contribute to bad parenting rather than just exposure to violence. One limitation mentioned in this study was that

individuals with low self-control may profess lower levels of actual violence exposure and increased self-control, thus influencing responses to survey items (see Piquero et al., 2000). The authors further suggested that the stability of self-control, throughout the life-course, could be called in to question (Arneklev et al., 1999; Mitchell & Mackenzie, 2006; Turner & Piquero, 2002). Finally, the study mentioned that it is possible to be raised in two different parenting schemes. One abusive parent may be identified as the bad parent while the other exhibits traits of a good parent. This may convolute any effect of parenting on the development of self-control.

In summary, many of the studies consider that the relationship between exposure to violence and antisocial behavior may be affected by some other factor. Similarly the current study suggests that the relationship between exposure to violence and antisocial behavior is moderated by other factors such as self-control. That is ones level of self-control may affect the relationship between antisocial behavior and exposure to violence. The next section discusses prior research which suggests that environmental factors are heavily influenced by internalized factors.

Internal factors, environment, and antisocial outcomes

In a study published in *Science*, Caspi and colleagues (2002) utilized data from the Dunedin Multidisciplinary Health and Development Study (DMHDS) to test if the relationship between childhood maltreatment and future antisocial behavior was moderated by monoamine oxidase A (MAOA) genotype. The MAOA gene produces the enzyme MAOA, and low levels of MAOA activity has been linked to aggression in mice (Cases et al., 1995) and humans (Shih & Thompson, 1999). Caspi and colleagues

hypothesized that individuals who were maltreated as children and had low MAOA activity would be more susceptible to antisocial behavior. Conversely, those with high levels of MAOA activity were less likely to develop antisocial behavioral problems as an adult. Their study yielded support for their hypothesis. Specifically, they had three general findings. First, participants who suffered from childhood maltreatment were significantly more likely to have a conduct disorder, to have a violent conviction, to have higher antisocial personality scores, score higher on a disposition to violence scale, and score higher on a measure of antisocial behavior. A second noteworthy finding was that the MAOA gene was not a significant predictor of any of the five antisocial outcome measures. The third important finding was that childhood maltreatment interacted with the MAOA gene and predicted a statistically significant amount of variation in four of the five outcome measures. This is a pivotal finding considering that childhood maltreatment has consistently been linked to adult antisocial behavior and there was little knowledge as to why some individuals would act on this predisposition while others did not. The results of this study were not without debate, and there have been several attempts to replicate this study. The findings of these replications are mixed, with the majority of studies finding support for the initial findings (Kim-Cohen et al., 2006; Nilsson et al., 2006; Sjöberg et al., 2007; Prom-Wormley et al., 2009; Enoch et al., 2010). Utilizing meta-analytical techniques, Kim-Cohen and colleagues (2006) found support for this genetic and environmental interaction and suggested that any inconsistencies in uncovering genetic and environmental interactions are most likely

due to discrepancies in methodology rather than the actual absence of an interaction (Fergusson et al., 2011).

Although this study was considering genetic markers, the underlying ideology is similar to that of the current study. That is, the level of MAOA is similar to the theorized relationship between internalized factors such as self-control and exposure to violence in the current study. The level of self-control an individual possesses may moderate the relationship between exposure to violence and antisocial behavior. Although there are other internalizing factors which may moderate the relationship between exposure to violence and antisocial behavior, self-control was selected as the moderator in this study because it has shown moderating effects across several other criminological constructs, and has yet to be explored.

Summary of the literature review

As presented, this literature review is broken up into five sections. First is a discussion of theory which suggests that there is a relationship between antisocial behavior and exposure to violence. The second section presents theory and research which would suggest a relationship between self-control and antisocial behavior. The third section discusses prior research which suggests that self-control moderates other criminological constructs. The fourth section discusses studies which find that the relationship between environmental factors such as exposure to violence and antisocial outcomes is affected by other factors. The fifth and final section presents research which focuses on how the influence of environmental factors on antisocial behavior changes depending on internal factors.

The first section presented decades of research suggests that there is a theoretical link between antisocial behavior and exposure to violence. This literature review briefly presented several theoretical approaches which explain the relationship between exposure to violence and antisocial behavior. The approaches specifically presented for those of Bandura (1973), Berkowitz (1974), Eron, Walder, and Lefkowitz (1971), Lorenz (1966). Bandura's approach to human behavior is derived from a social learning perspective, suggesting that antisocial behavior is a consequence of exposure to violence through transference. Eron and colleagues continue in a similar style as Bandura, suggesting that not only do children learn from other humans, they also learn from other mediums. Berkowitz suggested antisocial behavior is the result of impulsive tendencies. Lorenz argued that humans are instinctually aggressive and social ties alleviate this predisposition.

The second section presents the literature which proposes that self-control influences antisocial behavioral outcomes. Self-control theory has proven to be a very strong theory across disciplines but the most popular version in the field of criminology is that found in Gottfredson and Hirschi's (1990) book *A General Theory of Crime*. Self-control theory rests on the basic assumption that those persons who lack self-control tend to pursue their own self-interest without concern for the potential negative long-term consequences of their behavior. Although there's some confusion on how self-control is measured there are a vast number of studies and find a relationship between level of self-control and antisocial behavior.

The third section addresses prior research which suggests that self-control moderates other criminological constructs. Lynam and colleagues (2000) reported that the effect of neighborhoods on antisocial behavior was stronger among adolescent boys who were more impulsive. Meier and colleagues (2008) reported that the relationship between impulsivity and delinquency is greater in neighborhoods with low collective efficacy when compared to those neighborhoods with higher collective efficacy. Jones and Lynam (2008) suggested that sensation seeking and lack of premeditation had significant effects on antisocial behavior among both sexes and that the effects of informal social control on offending varied by both sensation seeking (among men only) and lack of premeditation. Wright and colleagues (2001) found that pro-social ties had a stronger deterrent effect among those lower in self-control when compared to those higher in self-control. Furthermore, Wright and colleagues (2001) introduced the idea of “social-amplification” and “social protection”. Higgins and Boyd (2008) concluded that parental social support can reduce the negative effects of low self-control and ultimately reduce antisocial behavior. Finally, Jones and colleagues (2007) found that parental support was a stronger inhibitor in reducing antisocial behavior among those with low impulse control. This lineage of research suggests that internalized factors such as self-control may change a relationship between environmental factors and antisocial outcomes.

The fourth section discusses how the relationship between exposure to violence and antisocial behavior may be impacted by other factors. Rosario and colleagues (2003) found that behavioral coping strategies reduced the effect of victimization on

delinquency for boys, but increased the effect of witnessing violence and delinquency for females. Hammack and colleagues (2004) suggested that there is some protective effect of social supports, but their strength changes depending on situational factors. Perceived social support also appeared to moderate the relationship between exposure to violence and criminal outcomes. Finally, Payne and colleagues (2011) look at the relationship between the development of self-control via exposure to violence and found that self-control did not explain the link between exposure to violence and antisocial behavior.

The last section of the literature review discusses studies which found that internal factors influence the effect environmental factors in determining behavior outcomes. Caspi and colleagues (2002) found that participants who suffered from childhood maltreatment were significantly more likely to have a conduct disorder, to have a violent conviction, to have higher antisocial personality scores, score higher on a disposition to violence scale, and score higher on a measure of antisocial behavior. Furthermore the MAOA gene was not a significant predictor of any of the five antisocial outcome measures unless childhood maltreatment was brought to into the model which suggests that MAOA gene interacted with childhood maltreatment.

The current study

Prior research suggests that self-control interacts with several other criminological factors. Although theoretically justified, no known study has confirmed whether self-control moderates the relationship between exposure to violence and antisocial behavior. A long history of literature supports the assertion that exposure to

violence increases the likelihood of future antisocial behavior, and studies on exposure to violence suggests that there are various factors influencing the impact of exposure to violence. The current dissertation explores how self-control influences relationship between exposure to violence and antisocial behavior. It is predicted that self-control will influence the relationship in the following manner. The effect of exposure to violence will be reduced among individuals with greater levels of self-control. Stated alternatively, the effect of exposure to violence on subsequent offending will be greater among those with lower self-control. This hypothesis is similar to other studies which found that internalizing factors can either buffer or enhance the relationship of exposure to violence.

CHAPTER THREE METHODOLOGY

The methodology chapter is broken into four main parts. The first section discusses the data for the current study and how it was obtained. The second section presents the study design while describing the dependent variables, independent variables and control variables. The third section explains how missing data was handled in the current study. The final section outlines the analytical strategy for the current study.

Data collection and procedures

The data for this study are from the Pathways to Desistance (Pathways study) project, which was a longitudinal study conducted over a seven-year period beginning in late 2000. These data are ideal for this study because it longitudinally tracks detailed offending patterns of convicted juveniles in two major US cities. These data also include prior information from several sources which define each participants living situation. Furthermore, these data contain several psychological measures including characteristics of self-control, which are theorized to moderate the relationship between exposure to violence and antisocial behavior. The measures included in the pathways study have received decades of validation from prior research and have proven to be reliable. Therefore these data are essential to conducting the current study, but furthermore these measures are prime for assessing both behaviors and attitudes.

Goals of the Pathways study

According to Schubert and colleagues (2004), the initial objective of the Pathways study was to explore the developmental progression, social environment, and interventions, which impact desisting from criminal behavior. The study was designed to collect multiple sources of information, such as self-report and official records. The Pathways study's sample consisted of 1,354 teens involved in the juvenile justice system. These were juvenile defendants ages 14 to 18 that were found guilty of a serious offenses. The Pathways study took place in Philadelphia, Pennsylvania, and Phoenix, Arizona. Eligible crimes were all felony offences, less serious property crimes, misdemeanor weapons charges, and sexual assault offenses. Due to the prevalence of drug charges among this age group, and males committing the majority of those charges, males with drug charges were capped at 15% at each location. Because females contributed to such a small portion of the initial sample, all females who qualified per the age and crime requirement were eligible for enrollment in to the Pathways study. For many of the participants the most common serious crimes were crimes against persons (e.g., armed robbery, felony assault). In most cases, this was not the participants' first court appearance.

Baseline interviews

During the baseline interview, information was collected from participants as well as the parents and/or guardians for 80% of the cases. The baseline interviews were carried out within 75 days of the youth's initial hearing. If the youth was tried as an

adult, baseline interviews were completed within 90 days of their decertification hearing¹ (in Philadelphia) or their arraignment hearing (in Phoenix).

Time point interviews

Following the baseline interview, participants were subjected to either “time point” interviews and/or “release” interviews. The time point interviews were carried out on six-month intervals starting six months after the baseline interview. The date of these interviews was determined by the date of the baseline interview to make certain there were equal measurement periods for all participants. This consistency allows for simpler statistical analysis in conducting developmental research focused on changes in human behavior (Schubert et al., 2004).

Location of interviews

The locations chosen for all interviews conducted were conducive to the comfort of the participant. Given this goal, the majority of interviews were conducted in the participant’s home, or for those that were in institutions, the interviews were conducted in a private room within the facility with the exception being situations where there was a concern for the interviewer’s safety. Although all participants were at some point incarcerated, the majority of interviews were conducted in the participants’ home while one third were conducted inside a facility. Roughly 10% were conducted elsewhere (Schubert et al., 2004).

¹ Initial hearing conducted to determine if the case would remain in the adult system or sent back to juvenile court. Note that there is no wave back provision to juvenile justice law in Arizona.

According to Schubert and colleagues (2004) the content collected during both baseline and time point interviews included background information (e.g., demographics, academic achievement, psychiatric diagnoses, offense history, neurological functioning, psychopathy, personality), attitudes and psychosocial development attitudes (e.g., impulse control, susceptibility to peer influence, perceptions of opportunity, perceptions of procedural justice, moral disengagement), personal relationships (e.g., quality of romantic relationships and friendships, peer delinquency, contacts with caring adults), family context (e.g., household composition, quality of family relationships), indicators of individual functioning (e.g., work and school status and performance, substance abuse, mental disorder, antisocial behavior) and community context (e.g., neighborhood conditions, personal capital, social ties, and community involvement). Due to the vast nature of the baseline interview, it was completed in two, two-hour sessions. Follow-up interviews took place over one two-hour session following the study design schedule every six months.

Release interviews had a narrower focus on obtaining information regarding environment and specific programs at residential intervention facilities. Specifically, information regarding the facilities' program operations, program dynamics, and the adolescent's assessment of the services offered. In regard to programs outside of facilities, such as community service programs, information was excluded. Reasons for its exclusion stem around the impossibility of collecting consistent, reliable information in court records as to the exact program and their implementation (Schubert et al., 2004).

Although extensive planning went into the design of the Pathways study, there are some notable issues which must be addressed. According to Schubert and colleagues (2004), there were four issues vital to the success of the pathways project. These four issues were site selection, measurement selection, method for data collection, and participant retention.

Site differences

There were significant differences in the processing of juvenile defenders at separate locations (Feld, 1991; Ghezzi & Kimball, 1986; Krisberg, Litsky, & Schwartz, 1984; Snyder & Sickmund, 1999), and failure to account for these differences can potentially limit the generalizability of studies such as the Pathways study. When there are multiple sites involved researchers should make a concerted effort to be familiar with the processes and procedures at each site and devise an appropriate sampling strategy. This strategy should be consistently implemented at each site. In the Pathways project, this limitation was acknowledged and much information was gathered on the policies and procedures at six potential locations. Philadelphia and Phoenix were selected mainly because they had high rates of serious juvenile offenses, a diverse racial demographics, an ample number of potential female subjects, varying treatment systems², political support from practitioners within the criminal justice system, and knowledgeable researcher to collaborate with at both venues (Schubert et al., 2004). Once the two locations were selected, a relationship was fostered with practitioners

² Noteworthy is that Philadelphia has a more intense treatment program than Phoenix.

including those within the court, probation, corrections, and service providers for both adult and juvenile correctional/judicial systems.

Measurement of Pathways study

The measurements included in the Pathways study were developed after an intensive review of the literature on which psychological and social function measures were the most appropriate for juveniles. According to Schubert and colleagues (2004), this task was a difficult one for several reasons. The first reason stems from following development stages across two separate age groups, adolescents and young adulthood. For example, the measures validated for one age group may have not been validated for other age groups. Second, the literacy of the participants was also an obstacle. Third, juvenile offenders come from a variety of cultural backgrounds, which often conflict with those in the literature (mainly from community samples of adolescents and young adults). Fourth, the life circumstances of an offender sample are much different from the community samples usually employed, who are generally high school students or college undergraduates. To compensate for this, researchers resorted to piloting an array of measures on juveniles in Pittsburgh and Philadelphia to generate a collection of measures that were reliable among this type of sample.

Method for data collection

The method for data collection in this study consisted of interviewers sitting with participants in front of a monitor they both could see. The use of computers during interviews proved beneficial for several reasons. The first is the linking of interviews across time. The interviewer was instantly able to cross reference information over

multiple time points. This allows the interviewer to check and see if information from one time point was consistent with those from another (error messages alerted the interviewer if inconsistencies existed). Another benefit to interviewers is that data is instantly updated so no information is lost during imputation. Furthermore, the interviewer's laptop was linked to a database at the University of Pittsburgh for which the data were instantly made available for subsequent analysis across all sites. One mentioned downside to utilizing computer technology for data collection was the major monetary investment to programs and software development prior to data collection (Schubert et al., 2004). Furthermore, employing these technologies within offender populations or high crime areas proposes concerns regarding theft, and steps had to be taken to safeguard the information stored on this equipment.

Tracking participants over time

The final obstacle mentioned by Schubert and colleagues (2004) in conducting a study of this magnitude was tracking participants over time. Utilizing individuals from high-risk populations over time makes it difficult to maintain participant involvement. The sample of juveniles frequently experienced changes in social context, such as residence, incarceration, changing schools, and involvement of peer groups, and it could often be difficult locate these individuals every six months (Schubert et al., 2004). To address this problem, the pathways project utilized a "multifaceted tracking protocol" which has been used in prior longitudinal studies (Cottler, Compton, Ben-Abdallah, Horne, & Claverie, 1996; Craig, 1979; Demi & Warren, 1995; Menendez et al., 2001). This protocol included an extensive program utilizing methods, including phone

calls during off hours, impromptu visits to participants suspected home and/or hangout, the use of all participants known contacts (i.e., family members and friends mentioned in previous interviews, address searches with credit databases, community agencies, and criminal justice facilities). The retention resulting from these efforts is relatively high, with a retention rate of 93% up to the 24-month time point and around 84% by 84 months.

Data justification for current study

Overall the Pathways data is optimal for the current study due to the wide array of environmental and psychological measures. Furthermore the measures used in the Pathways study were selected due to their consistent reliability and validity across decades of research. The longitudinal nature of the study is also an integral part of the current study in that the independent variables in the control variables are taken at waves one while the dependent variables are constructed from subsequent waves. Furthermore the sample utilizes an offender population which could be deemed more “at-risk”. Therefore it is expected that there is an increased prevalence for risk-factors such as low self-control and exposure to violence to which this study is interested. The next section outlines the design of the current study.

Current study design

As mentioned above, this study utilizes the Pathways to Desistance data. To strengthen the design of the current study each wave of the Pathways study is used. The independent variables and control variables are taken at baseline, while the outcome variables, general offending and violent offending, are computed from

subsequent waves. The descriptive statistics for the variables utilized are presented in Table 1. As mentioned, general offending and violent offending is measured in waves 2 through 11 (months 6 through 84) while all other variables were measured at baseline. At waves two (6 month) through seven (36 months), questions were asked regarding the period six months prior to questioning. During the later waves, eight (48 month) through 11 (84 month), questions were asked regarding behavior during the prior 12 months. Utilizing the data from the Pathways study in this manner will ensure temporal order, as the dependent variable is measured after the independent and control variables. The next section provides definition of terms, which is followed by a description of variables and how they are measured.

Table 1. Descriptive Statistics.

Measure	<i>M</i>	Skewness	SD	Range
General Offending	5.47	0.99	4.72	0 - 20
Violent Offending	2.46	0.96	2.15	0 - 8
Exposure to Violence	5.34	-0.01	2.99	0 - 13
Low Self-Control	5.77	0.08	2.09	0-11.5
Age	16.53	-0.26	1.11	14 - 18
Male (female=0, male=1)	0.86	-2.13	0.34	0 - 1
Black (nonblack=0, black=1)	0.41	0.35	0.49	0 - 1
White (nonwhite=0, white=1)	0.20	1.48	0.40	0 - 1
Hispanic (nonhispanic=0, hispanic=1)	0.33	0.70	0.47	0 - 1
Neighborhood	2.35	0.10	0.75	1 - 4
Delinquent Peers	2.32	-0.38	0.40	1 - 5
Time in Streets	0.70	-0.74	0.28	0.001 - 1

Dependent variables

General offending

The general offending measure included in the Pathways to Desistance data was designed to measure an adolescent's account of involvement in antisocial and illegal activities (Huizinga, Esbensen, and Weiher, 1991). The original general offending measure at each wave consists of 24 items, which elicit self-reported involvement in serious criminal activity.³ For the individual items in the general delinquency measures, see Table 2. During questioning the subjects were asked whether they had participated in the specific item and if they indicated they were involved, follow-up questions were asked regarding the frequency of occurrence. The general offending dependent variable in the current study was calculated by utilizing the occurrence of each of these 20 items over waves 2 through 11. According to Paschall and colleagues (2001:184-5), "self-report measures constructed from data collected at multiple time points are likely to have better criterion validity than self-report measures constructed from data collected at a single time point." Furthermore, variety scales count the number of different types of antisocial acts an individual has committed rather than the frequency of occurrence.

³ Four of the items from this scale were excluded from the current study for two reasons. First, two of the items ("Broke into car to steal" and "Went joyriding") were added to the Pathways questionnaire after many of the participants had already completed their baseline or six-month follow-up interview. The introduction of these two items resulted in a large amount of missing data. To avoid complications and inconsistencies, these two items are excluded. The second two items ("Forced someone to have sex" and "Killed someone") excluded from this analysis were masked for confidentiality in the data set provided by ICPSR. One noted limitation of this study is that by excluding rape and murder, violent antisocial behavior might be underestimated.

Table 2. Items in the General Offending Measure.

Destroyed/damaged property
Set fire
Broke in to steal
Shoplifted
Bought/received/sold stolen prop
Used check/credit card illegally
Stole car or motorcycle
Sold marijuana
Sold other drugs
Carjacked
Drove drunk or high
Been paid by someone for sex
Shot someone bullet hit
Shot at someone no hit
Took by force with a weapon
Took by force without a weapon
Beat up someone serious injury
In a fight
Beat someone as part of gang
Carried a gun

Variety scales are commonly used in criminological research and they are highly correlated with other measures of serious antisocial behavior, represent the same propensity for antisocial behavior, but are less prone to recall error than self-reported frequency scores (Hindelang, Hirschi & Weis, 1981; Thornberry & Krohn, 2000; Sweeten, 2012). These variety scales are particularly useful when the frequency of occurrence is extremely high, such as in drug offenses. In calculating the variety scale over these nine waves, the variety counts over all waves were summed. If an incident occurred in any wave it would be captured in this measure. The attainable range of the general offending variable in this study ranges from 0 to 20.

Violent offending

The violent offending measure is derived from the general offending measure included in the Pathways to the Desistance data, which was designed to measure an adolescent's account of involvement in antisocial and illegal activities (Huizinga, Esbensen, and Weiher, 1991). Similar to the general offending measure, the violent offending measure is calculated from each wave and consists of eight items that elicit self-reported involvement in violent criminal activity. For the individual items in the violent offending measures see Table 3. If the subject confirmed they were involved in the listed activity during the questioning, follow-up questions were asked regarding the frequency of occurrence. The violent offending variable in the current study was calculated by utilizing the occurrence of each of these eight items over waves 2 through 11.

Table 3. Items included in the Violent offending measure

Shot someone bullet hit
Shot at someone no hit
Took by force with a weapon
Took by force without a weapon
Beat up someone serious injury
In a fight
Beat someone as part of gang
Carried a gun

In calculating the variety proportion over these nine waves, the variety of items over each wave was summed. Therefore the attainable range of the violent offending variable in this study ranges from 0 to 8.

Independent variables

Exposure to violence

Exposure to violence is measured utilizing a modified version of the exposure to violence inventory created by Selner-O'Hagan and colleagues (1998). The goal of this inventory is to capture the type of violence that the adolescent has experienced or observed. Six items were utilized to capture experienced violence (e.g., "Have you ever been chased where you thought you might be seriously hurt?") and seven items to measure observed violence (e.g., "Have you ever seen someone else being raped, an attempt made to rape someone or any other type of sexual attack?"). In addition to these 13 items, the exposure to violence inventory includes four questions inquiring about the participants' exposure to death (e.g., has anyone close to you tried to kill him/her self, has anyone close to you died, have you ever found a dead body, have you ever tried to kill yourself). A variable was then calculated utilizing these 17 items, summing the number of violent occurrences witnessed and violent occurrences victimized.

Low self-control

Due to the complex nature of self-control, researchers have developed several ways to capture this concept (see Longshore, Turner, & Stein, 1996; Piquero, MacIntosh, & Hickman, 2000; Tittle, Ward, & Grasmick, 2004). Specifically, there has been much debate on whether self-control should be measured attitudinally or behaviorally. Self-

control in the current study is measured attitudinally using the Weinberger Adjustment Inventory (WAI, Weinberger & Schwartz, 1990). The WAI was constructed to measure hierarchical levels of self-reported social-emotional adjustment among both children and adults. Specifically, this inventory assesses two main aspects of social emotion, the affective dimension and the restraint dimension. The affective dimension encompasses subjective experiences of distress such as anxiety, depression, low self-esteem, and well-being. The second dimension of restraint encompasses social factors and self-control. These two dimensions can be linked to the “big five” factors of personality (McCrae & Costa, 1987) and the three factor models of both Eysenck and Tellegen (Weinberger & Schwartz, 1990). The WAI has proven to be reliable and valid (Feldman & Weinberger, 1994; Weinberger, 1990) and rivals other personality assessment inventories, such as the Minnesota Multiphasic Personality Inventory (see Huckaby, et al., 1998). Although the WAI has two dimensions, the current study utilizes measures from the restraint dimension. The restraint dimension mirrors measures consistent with the definition of self-control as theorized by Gottfredson and Hirschi (1990). Particularly, the elements that resemble self-control are impulse control, suppression of aggression, and consideration of others.⁴

The subscales of WAI that are utilized in the current study are impulse control, suppression of aggression, and consideration of others. Participants read various statements and were asked to rate how accurate these statements were to the last six

⁴ Although Responsibility is one component of the WAI it is not included in this study, as there would be predictor-criterion overlap.

months of their life. These statements were ranked on a scale of 1 to 5 (1=False to 5=True). After some necessary reverse coding, higher scores were indicative of greater levels of the construct (i.e., more impulse control, suppression of aggression, and consideration for others).

A composite score was created from the three subscales (impulse control, suppression of aggression, and consideration of others). The measure for impulse control was a scale of eight items which yielded a Cronbach's alpha of .76⁵. These items consisted of statements aimed at addressing the ability to regulate spontaneous acts (e.g., "I do things without giving them much thought"). Suppression of aggression is another component of the restraint dimension of the WAI, and consisted of seven items (e.g., "People who make me angry better watch out") and was utilized to assess the respondent's ability to deal with anger without hurting others. Suppression of aggression yielded a Cronbach's alpha of .78. Consideration of others is comprised of seven items, which assess one's ability to selflessly assist others (e.g., "I often go out of my way to help others"). Consideration of others yielded a Cronbach's alpha of .73.

Although there is some debate as to how to measure self-control (see Longshore, Turner, & Stein, 1996; Tittle, Ward, & Grasmick, 2004), behaviorally, attitudinally, or some combination, the substantial conclusions of prior research has remained relatively consistent. As mentioned above, the current study utilizes an attitudinal measure consistent with prior research (Tittle et al., 2004). This measure contains the majority of

⁵ The generally accepted cutoff for Cronbach's alpha is .7 (see Lance, Butts, & Michels, 2006)

the dimensions of self-control as described by Grasmick and colleagues (1993), but does not measure for a predisposition for physical and less complicated tasks. Prior research offers little support for these excluded measures (Arneklev, Grasmick, & Bursik, 1999; Arneklev, Grasmick, Tittle, & Bursik, 1993). The measure for self-control was then reverse coded to be consistent with the exposure to violence measure. Accordingly, those individuals with higher scores would resemble individuals with lower levels of self-control.

Control variables

Demographic controls

Age is utilized as a control variable in this study due to its relationship with antisocial behavior. Much of criminological literature suggests that age is a very good predictor of antisocial behavior because the majority of individuals commit crimes between roughly the ages of 15 to 21 (Hirschi & Gottfredson, 1983). This is often referred to as the aggregated age crime curve or continuum. Age is also commonly used as a control variable for criminological research given it is a measure of time and can be viewed as such: as an individual ages, naturally, the more opportunity the individual has had to commit more crime.

There are considerably fewer females than males in this sample (i.e., 1170 males and 184 females) but gender is a commonly used control variable in criminological research. It is a common control variable because typically males commit and self-report more crime than females (Steffensmeier & Allan, 1996). Furthermore, some research suggests that there may be gender differences among the predictors of exposure and

violent behavior. Several studies have noted that males are more likely to be exposed to violence than females (Carbone-Lopez, Esbensen, & Brick, 2010; Haynie et al., 2009; Malik, Sorenson & Aneshensel, 1997; Purugganan et al., 2000; Scarpa, 2001; Stein et al., 2003). Therefore, gender will be utilized as a control variable in the current study.

Race

Prior literature suggests that people of color are more likely to be exposed to violence (Stein et al., 2003), therefore it is necessary to control for race in the study. As discussed in the introduction, people of color are more likely to reside in living conditions where exposure to violence is more commonplace (Fitzpatrick & Boldizar, 1993). Both African-American and Hispanic youth reported higher rates of witnessing violence than whites at every income level (Crouch et al., 2000). Therefore the impact of exposure to violence may be different for those individuals who are more exposed to violent situations.

Neighborhood

Neighborhood condition was added as a control variable. Individuals born into less than desirable living conditions where violence is commonplace have less opportunity for desirable jobs or higher education, which may increase the likelihood of antisocial behavior (Berkowitz, 1993; Dodge & Price, 1994). This disadvantage predisposes individuals that reside in less than desirable living conditions to a higher risk for antisocial behavior and these circumstances should be controlled when assessing causes for delinquency. Thus, in the current study a measure of neighborhood condition is included. The neighborhood measure used in this study was aimed to

measure the environment surrounding the adolescent's home (Sampson & Raudenbush, 1999). The items from this self-reported measure identify physical disorder in the participant's neighborhood (e.g., cleanliness of the street, graffiti on walls of buildings), as well as social disorder (e.g., adults fighting or arguing, people using drugs). This measure contains 21 items to which participants respond to on a 4-point Likert scale ranging from "Never" to "Often," with higher scores indicating greater disorder within the community. The scale yielded high internal consistency with an alpha of .94.

Peer delinquency

The measure of peer delinquency is a subset of 12 items which were originally developed for the Rochester Youth Study (Thornberry et al., 1994). These measures are designed to measure the degree of antisocial behavior among the adolescent's peers. Specifically, this item measures the prevalence of friends who engage in 12 types of deviant behavior (e.g., "How many of your friends have sold drugs?"). The mean rating of prevalence of friends involved in these behaviors is computed and used as a final peer delinquency measure. Peer delinquency is an essential measure to be included when isolating the relationship between self-control and other criminological constructs (Baron 2004; Burton et al. 1994; Evans et al. 1997; Perrone et al. 2004).

Exposure time

Given the longitudinal nature of the study coupled with the fact that the sample is made up of an offender population, time on the streets must inherently be controlled for. The justification for using this measure is that those with time on the streets have more opportunity to commit antisocial behavior. During the interviews participants

reported the number of calendar days they were in a detox/drug-treatment program, psychiatric hospital, residential treatment program, or secure institution. A measure of the proportion of the time a participant spends outside of these facilities is measured at each time point. From these overall time point measures a proportion of total time outside of these facilities is created. The proportion of time the participant was on the street is used as a covariate in the regression models.

Missing data

In this study, as well as the majority of studies in social sciences, especially longitudinal studies, missing data is a reality that must be dealt with. In the current research, missing data was ultimately handled using list-wise deletion. Several comparison models were computed to justify utilizing this method for dealing with missing data. First, preliminary models were run to address missing data of the dependent variables. These models were run based on percentages of 70%, 80%, 100% complete data on the dependent variable and the models were not substantively different from one another. Also to deal with missing data in this study, maximum likelihood estimation is utilized in the initial regression models, these findings were then compared to models using listwise deletion. Maximum likelihood estimation is a validated approach to dealing with missing data and is arguably amongst the most versatile and accurate methods (Schlomer, Bauman, & Card, 2010). Maximum likelihood estimation uses the same estimation procedure as logistic regression and several other analyses (e.g., probit, ordered logit). Unlike other methods for dealing with missing data, which impute or drop data, maximum likelihood estimation

produces parameters that have the highest likelihood of occurring from the observed data. Simply stated, maximum likelihood estimation uses all the data to obtain estimates that are most likely to produce the observed data set. This method has two distinct advantages over other methods of imputation. First, the calculations to adjust for missing data in the analysis are conducted within the same analytical step. Second, maximum likelihood estimation preserves the sample size, which produces accurate standard errors (Schlomer, Bauman, & Card, 2010). Due to the limitations and the complexity of running nonlinear models in the later part of the current study, these models utilize the default method for dealing with missing data in regression modeling techniques for Stata 13. The default techniques for dealing with missing data in these regression models is equation-wise deletion. Given the minimalism of the models in the current study this equation-wise deletion ultimately equates to list-wise deletion. The comparison regression models are found to be substantively similar and once the “time in the streets” variable is excluded, missing data is reduced to around 3 percent.

Analytic strategy

Many researchers often use stages to organize their statistical strategy. This method will also be utilized in this study. Presented in this order, the following research questions will be addressed as the study unfolds:

Question 1. Is there a relationship between exposure to violence and antisocial behavior within a sample of serious and violent juvenile offenders?

Question 2. Is there a relationship between exposure to violence and violent antisocial behavior within a sample of serious and violent juvenile offenders?

Question 3. Is the relationship between exposure to violence and antisocial behavior affected by one's level of self-control?

Question 4. Is the relationship between exposure to violence and violent antisocial behavior affected by one's level of self-control?

As the variables for the study have already been defined above, the first statistics presented will be bivariate correlations for the variables utilized in this study. Once noteworthy portions of the correlation matrix have been interpreted, a series of regression models are constructed with the latter models addressing the interaction between self-control and exposure to violence on reported antisocial behavior. The first regression models are constructed using maximum likelihood for missing data which is the optimal strategy for dealing with missing data in the current study. The "time in the street" controls for an individual's opportunity to commit crime across longitudinal data. Because of the longitudinal nature of this variable, a large portion of these data were missing in the publicly available data set. Although important, the time in the street variable has 492 (36%) missing values, mostly due to missed interviews at some time point during the seven year period. To account for this, the early models use maximum likelihood for missing data which optimally accounts for missing data and preserves sample size. These models using maximum likelihood for missing data are then compared to models which exclude the "time in the street" variable.⁶ Once it is

⁶ The dependent variables were computed across waves 2-11 which (similar to "time in the streets") also resulted in 39% missing data on the general offending variable. Models were then created using 70%, 80%, and 90% complete data which all yielded similar results. A final model was computed imputing zeros for missing values to retain sample size and this model was compared to a model using maximum

confirmed that excluding the “time in the street” variable does not substantially take away from the model, subsequent models are computed using the Stata 13’s default for missing data, listwise deletion. A series of OLS⁷ regression models are constructed to test the interaction between exposure to violence and self-control on general offending. The same procedure is used to test the interaction between exposure to violence and self-control on violent offending. After the construction of linear models, the final models are designed to test for non-linear relationship between the interaction of exposure to violence and self-control on both general offending and violent offending. These final regression models will address the overarching research question, which is whether or not there are interaction effects that exist between self-control and exposure to violence on subsequent antisocial behavior. More specifically, does self-control moderate the relationship between exposure to violence and antisocial behavior?

likelihood for missing values and the results were substantively similar. Therefore it is justified to utilize imputed zeros for missing values in subsequent models for both general offending and violent offending. ⁷ There is some debate in criminological research as to which regression models should be used to acquire accurate predictions while utilizing antisocial behavior as an outcome. The type of dependent variable such as count variables or variety index could illicit the use of regression models which adjust for this type of data (e.g., Poisson based models, Tobit models). Some of this controversy revolves around the shape of the distribution of the residuals (See Appendix E regarding models for the shape of the distribution of the residuals). An assumption in OLS regression that the distribution of the residuals mimic that of a normal distribution. As observed in Appendix E, which plots the residuals against a plotted normal distribution line, the residuals somewhat mimic a normal distribution but not exactly. Although this dissertation focuses on basic OLS regression models series of post-hoc Poisson based models are also utilized. Using a series of fit statistics this dissertation ultimately concludes that zero-inflated negative binomial regression may be the best model utilizing this data. Zero-inflated negative binomial regression was appropriate because the dependent variable was count based (Long, 1997). Although the Poisson regression model is the most basic form of the count-based models, it was not suitable due to the number of a high number of zeros and overdispersion in the distribution in the general offending measure. The model utilizing zero-inflated negative binomial regression are presented in Appendix F for general offending and Appendix G for violent offending.

CHAPTER FOUR RESULTS

The results section is organized in the following manner. First the bivariate correlations are presented and notable relationships are discussed. Second, the preliminary baseline regression models are interpreted. Finally, the third section presents a series of regression models which include interaction effects and illustrate the interactive nature of the relationship between self-control, exposure to violence, and antisocial behavior.

Bivariate correlations

The bivariate correlations are presented in Table 4. The correlations address research question 1, which is focused on whether or not a relationship exists between exposure to violence and antisocial behavior within a sample of violent juvenile offenders. In reviewing the correlations, a relationship between exposure to violence and general offending is noted ($r = 0.35, p < .001$). This relationship affirms the first research question of this dissertation.

Table 4. Bivariate Correlations.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) General Offending											
(2) Violent Offending	0.92***										
(3) Exposure to Violence	0.35***	0.38***									
(4) Low Self-Control	0.38***	0.34***	0.32***								
(5) Delinquent Peers	0.37***	0.36***	0.58***	0.43***							
(6) Neighborhood	0.10***	0.12***	0.31***	0.16***	0.26***						
(7) Male	0.16***	0.20***	0.12***	0.05	0.09**	0.03					
(8) Black	-0.09***	-0.02	0.04	-0.13***	-0.08**	0.21***	0.04				
(9) White	0.07*	-0.02	-0.09***	0.07**	-0.07**	-0.20***	-0.06*	-0.42***			
(10) Hispanic	0.03	0.03	0.03	0.07*	0.13***	-0.02	0.02	-0.60***	-0.36***		
(11) Age	-0.04	-0.05**	0.19***	-0.03	0.20***	0.14	0.04	0.04***	-0.04	-0.02	
(12) Time in Streets	-0.29***	-0.31***	-0.29***	-0.14***	-0.28	-0.15***	-0.15***	-0.03	0.11***	-0.07*	-0.04

Note: *** p<.001, **p<.01, *p<.05

Addressing the first research question, the correlation table shows a moderate positive relationship between exposure to violence and antisocial behavior which corresponds with prior research that suggests exposure to violence has some relationship with subsequent offending. The correlation matrix also reveals a moderate and positive relationship between exposure to violence and subsequent violent offending ($r = 0.38, p < .001$). This finding supports the proposition that violence may lead to violence.

Another correlation worth noting is the relationship between self-control and general offending ($r = 0.38, p < .001$). Consistent with prior research, this finding suggests that individuals with greater levels of self-control report lower levels of general offending.

There is also a moderate relationship between self-control and exposure to violence ($r = 0.32, p < .001$). This indicates that individuals with lower levels of self-control are more likely to report greater levels of exposure to violence.

Preliminary regression models

A series of regression models were used to better understand the relationship between exposure to violence, self-control, and antisocial behavior. The first step in developing these regression models was to create a model which could utilize the maximum likelihood for missing data. With the exception of the "time in the street" variable, the data overall was nearly complete but initially missing data was controlled for due to the known loss of data on the "time in the street" variable, as mentioned previously. Once these general models are constructed they were then compared to subsequent models which did not include the "time in the street" variable. These

models are presented in Appendix A through D. The models reported in Appendix A and B included the “time the street” variable while the subsequent models did not.⁸

Although many statisticians and social scientists would argue data retention is essential, the unfortunate truth is that much of the “time in the street” variable is missing and there is some to gain (retain sample size) from excluding that variable while little to lose (the models are substantively the same). With the removal of the “time in the street” variable the amount of missing data drops to around 3%, which suggests that missing data is no longer a problem in the use of maximum likelihood

⁸ In reviewing the results from these four models, the coefficients appear to be substantively similar. That is, the directions of the relationship, as well as which variables are significant, are the same. The magnitudes of the coefficients change slightly, as well as the standard errors, but overall the model is almost the same. Appendix A displays the results for the first model which focused on the relationship between exposure to violence and self-control on general antisocial behavior. Both independent variables and the interaction term are significant which suggests that there is an interaction between self-control and exposure to violence on antisocial behavior ($b = -0.04$, $SE = 0.02$, $p < .05$). Furthermore each control variable is also significant ($p < .05$) with the exception of neighborhood condition. Exposure to violence exhibited a positive relationship with antisocial behavior ($b = 0.61$, $SE = 0.17$, $p < .001$). Self-control exhibited inverse relationship with antisocial behavior ($b = -0.32$, $SE = 0.11$, $p < .01$). The interaction term will be better fleshed out and subsequent models. Appendices C and D display the results for the same models and as appendices A and B with the exclusion of the “time in the street” variable. Noted in these models is the finding that the relationships between the initial models which utilized maximum likelihood estimation for missing values and retained the “time in street” variable are substantively the same. In Appendix C, which directly compares to Appendix A, it is noted that exposure to violence ($b = 0.67$, $SE = 0.17$, $p < .001$) and self-control ($b = -0.30$, $SE = 0.11$, $p < .01$) are both significantly related to general antisocial behavior and that the interaction term ($b = -0.03$, $SE = 0.02$, $p < .05$) is also significant. Furthermore, each of the control variables are significant with the exception of neighborhood condition. Further noted is that each of these relationships were also in the same direction as the prior model. That is, self-control has a relationship with antisocial behavior and exposure to violence has a positive relationship with antisocial behavior. The coefficients and standard errors change slightly, but for the purposes of this study this change does not discredit the subsequent models. Appendix B displays the relationship between exposure to violence, self-control, and violent offending. This model focuses on violent offending and reveals the same general trends the prior model shows in regards to the independent variables. The relationship between exposure to violence and violent antisocial behavior remained significant ($b = 0.36$, $SE = 0.08$, $p < .001$) while the relationship the effect of self-control is not significant at average levels of exposure to violence antisocial behavior fails to meet the same significance threshold ($b = -0.09$, $SE = 0.05$, $p < .10$) and the coefficients have also decreased slightly. The control variables that have a significant relationship with violent offending are delinquent peers, gender, age, and time in street.

estimation for missing values is no longer a necessity. The subsequent models utilize the Stata 13 default method, listwise deletion, to address missing data.

Linear regression models

Baseline model for general offending

The first base model of this dissertation is directed at the relationship between exposure to violence, self-control, and general offending. The results for this model are displayed in table 5. In this model exposure to violence had a positive relationship with antisocial behavior ($\beta = 0.19, p < .001$). That is, greater levels of exposure to violence predicted higher levels of general offending. Continuing, low self-control had a positive relationship with antisocial behavior ($\beta = 0.23, p < .01$). Therefore, participants who exhibited the least amount of self-control exhibited the highest levels of offending. Furthermore, each of the control variables, with the exception of neighborhood conditions, were also significant.

Table 5. Exposure to violence and self-control predict general offending.

	General Offending	
	b	SE
Exposure to Violence	0.31***	0.05
Low Self-Control	0.51***	0.06
Delinquent Peers	0.87***	0.16
Neighborhood	-0.13	0.16
Male	1.63***	0.33
Black	-0.94**	0.30
Hispanic	-0.72*	0.30
Age	-0.41***	0.10

* p<.05 ** p<.01 *** p<.001

Baseline model for violent offending

The second baseline model is presented in table 6, which displays the relationship between exposure to violence and self-control on violent offending. Similar to general offending, this model displays a significant relationship between exposure to violence and violent offending ($\beta = 0.25, p < .001$). The baseline model also displays significant relationship between self-control and violent offending ($\beta = 0.20, p < .001$).

Table 6. Exposure to violence and self-control predict violent offending.

	Violent Offending	
	b	SE
Exposure to Violence	0.18***	0.02
Low Self-Control	0.21***	0.03
Delinquent Peers	0.34***	0.07
Neighborhood	-0.05	0.08
Male	0.96***	0.15
Black	-0.02	0.14
Hispanic	-0.09	0.14
Age	-0.23***	0.05

* $p < .05$ ** $p < .01$ *** $p < .001$

Interaction model for general offending

The third model incorporates the interaction term which tests whether self-control and exposure to violence interact to predict general offending. Table 7 displays the results for the interaction model which predicts general self-reported offending. This model is comparable to the first baseline model which can be found in table 5. The results of this interaction model indicate that there is an interaction effect between self-control and exposure to violence on general offending ($\beta = 0.05, p < .05$). Therefore, self-

control does appear to moderate the effect of exposure to violence in its relationship to subsequent general offending.

Table 7. Interaction between Exposure to Violence and Self-control on General Offending.

	General Offending	
	b	SE
Exposure to Violence	0.32***	0.05
Low Self-Control	0.52***	0.06
Exposure to Violence X Self-Control	0.04*	0.02
Delinquent Peers	0.85***	0.16
Neighborhood	-0.14	0.16
Male	1.64***	0.33
Black	-0.92**	0.30
Hispanic	-0.75*	0.30
Age	-0.40***	0.10

* p<.05 ** p<.01 *** p<.001

To better decipher and interpret interaction models it is useful to utilize marginal effects. Marginal effects are plotted based on the predicted value of the dependent variable based on the explanatory variables. To calculate this, the regression model utilizes the values of the predictor variables to obtain a conditional expected value of the dependent variable. Figure 1 displays the margins plot of the interaction model between exposure to violence and self-control predicting general offending. While the independent variables self-control and exposure to violence range according to the graph, all other control variables are held constant at their mean. Figure 1 shows a linear relationship between self-control and exposure of violence on general offending.

The levels of self-control (e.g., high self-control, high-medium, low-medium self-control, and low self-control) were selected based on the range of self-control. Therefore individuals who scored greater on the self-control are accounted for accordingly while those who scored low on the self-control measure are similarly included. Figure 1 displays the effect of exposure to violence based on different levels of self-control. It is observed that those with greater levels of self-control appeared to be less impacted by the effect of exposure to violence. Individuals with more self-control increased in the predicted value of general offending from five to around 10 occurrences relative to the level of exposure to violence. Individuals with high-medium self-control increased and predicted general offending from around 8 offences to around 15. Individuals with low-medium levels of self-control displays an increase of around 10 occurrences of predicted general offending to around 20. Finally, individuals with low self-control exhibited the largest change with an increase from 13 to around 25 incidents of predicted general offending. This model suggests that there is some buffering effect on the impact of exposure to violence on general offending depending on one's level of self-control. That is, self-control reduces the negative impact of exposure to violence. Also, individuals with higher levels of exposure to violence and low levels of self-control are more prone to offending. Conversely, individuals with low levels of exposure to violence and low levels of self-control are predicted to offend at a higher rate than those with greater levels of self-control. Furthermore, this model suggests that that the effect that self-control has in the relationship between exposure to violence and antisocial behavior appears to be less relevant at greater levels of self-control. Therefore one's level of self-

control seems to have more of an impact on individuals with higher levels of exposure to violence. This initial model answers research question three. Research question three addresses the relationship between exposures to violence on general offending. Continuing, this model suggests that the effects of exposure to violence on antisocial behavior changes depending on one's level of self-control. As discussed later, this is an interesting finding that supports prior research, which finds that the impact of environmental factors may be contingent on some internalized factor. In this situation, the impact of exposure to violence on antisocial behavior changes depending on one's level of self-control.

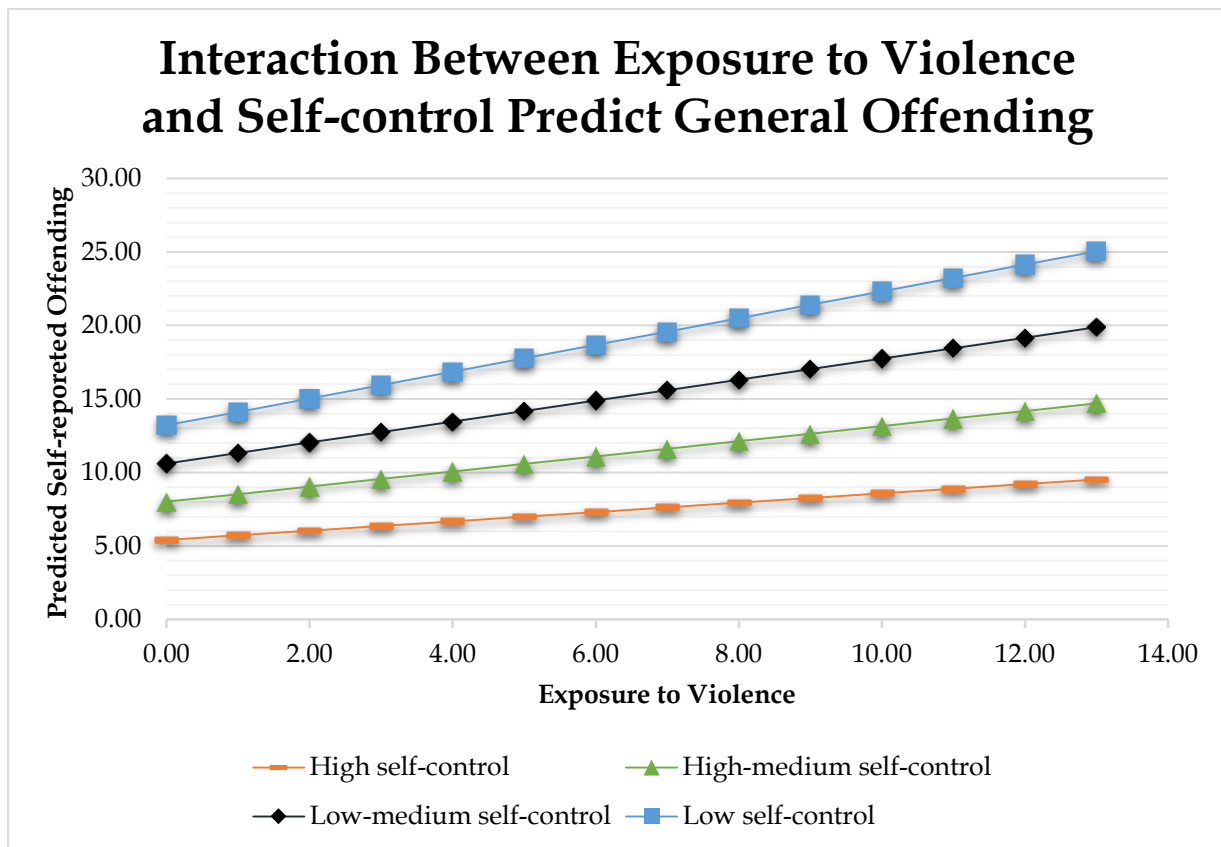


Figure 1. Interaction between Exposure to Violence and Self-control Predict Self-Reported Offending.

Interaction model for violent offending

The second model constructed in this dissertation explores the interaction between exposure to violence and self-control on violent offending. As discussed in the literature review, many researchers find a relationship between exposure to violence and subsequent violent offending. This relationship is referred to as the cycle of violence. The model presented in table 8, which tests the relationship between exposure to violence and self-control on violent offending. Similar to the prior model which utilized general offending as the outcome, this model demonstrates that exposure to violence ($\beta = 0.25, p < .001$) and self-control ($\beta = 0.20, p < .001$). Furthermore, the interaction of exposure to violence and self-control on violent offending is also significant ($\beta = 0.07, p < .01$). This indicates that there appears to be a moderation effect between exposure to violence and self-control. That is, the impact of exposure to violence appears to be contingent on the level of self-control. Figure 2 displays this relationship utilizing a margins plot which plots the predicted level of offending based on levels of self-control and exposure to violence in the interaction model of self-control and exposure to violence on violent offending.

Table 8. Interaction between Exposure to Violence and Self-control on Violent Offending.

	Violent Offending	
	b	SE
Exposure to Violence	0.18***	0.02
Low Self-Control	0.21***	0.03
Exposure to Violence X Self-Control	0.02**	0.01
Delinquent Peers	0.33***	0.07
Neighborhood	-0.06	0.08
Male	0.97***	0.15
Black	-0.00	0.14
Hispanic	-0.11	0.14
Age	-0.22***	0.05

* p<.05 ** p<.01 *** p<.001

One conclusion from Figure 2 is that relative to these data, there is a relationship between exposure to violence and self-control on violent offending. This finding is similar to the prior model which looked at general offending. The current model suggests that as exposure to violence increases and self-control decreases, there is a greater likelihood for violent behavior. Conversely, as self-control increases and exposure to violence decreases there is a less likelihood for violent outcomes.

Furthermore, self-control also appears to buffer the effect of high exposure to violence on violent offending. This model addresses research question four which assess the relationship between self-control and exposure to violence and violent offending. This model confirms that there is an interaction between environmental factors and internalized factors when predicting violent offending.

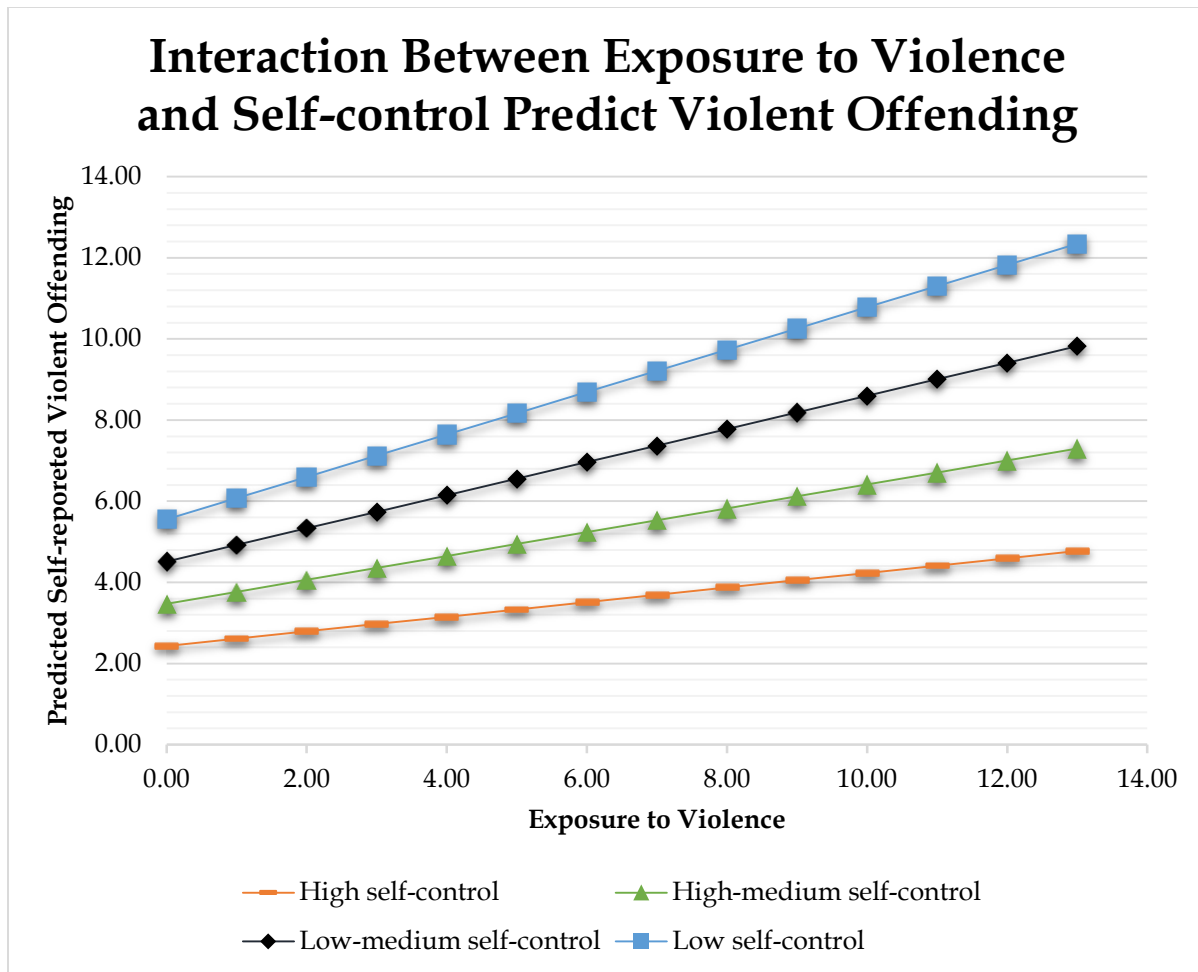


Figure 2. Interaction between Exposure to Violence and Self-control Predict Violent Offending.

The next chapter presents a discussion and conclusion of the current research. In this section as discussed how the results of this study impact criminological theory, and policy implications. Furthermore, the next section includes a thorough discussion of the strengths and limitations of the current study. Finally the section concludes with a discussion of directions for future research.

CHAPTER FIVE DISCUSSION AND CONCLUSION

The conclusion chapter is presented in the following five sections. The first section presents a summary of the findings in the current research. The second section describes some implications for criminological theory. The third section describes some possible implications for practitioners. The fourth section highlights the known limitations of the current research. Finally, the fifth section concludes with a discussion of directions for future research.

Summary of findings

Research question one

There were several questions addressed in this dissertation. The first research question was directed at identifying whether exposure to violence is related to subsequent offending among a sample of arrested juvenile offenders. The data indicated that there was a relationship between individuals who were exposed to violence and subsequent general offending. Although not surprising, this is an interesting finding due to the limited amount of research utilizing an offender sample. There are many restrictions on studying offenders and the majority of criminological research is conducted on college samples which may be more representative of the general population. In turn there has not been a great deal of research which can affirm the hypothesis that exposure to violence is prevalent among a sample of juvenile offenders.

Research question two

The second research question addressed the relationship between self-control and subsequent violent offending. The majority of the studies that have measured the effects of self-control do so on a more generalized sample rather than utilizing an offender sample; thus, including a sample of delinquent youths is unique to the current study. Furthermore, many previous efforts have examined the self-control offending relationship cross-sectionally. The current study found support for the relationship between self-control and antisocial behavior longitudinally and among a sample of convicted juvenile offenders. This sample of offenders is representative of a proportion of a marginalized population in the United States who are exposed to high levels of violence, poverty, mental illness, dysfunctional families, and deplorable neighborhoods (Reingle et al., 2011; Chung & Steinberg, 2008; Mulvey et al., 2010; Tolan, Gorman-Smith, & Henry, 2003). It is often argued that due to the ethnic disparities among the correlates of crime, such as exposure to violence, these predisposition factors could be considered during sentencing or in developing treatment plans for individuals convicted of a crime or considered crime prone.

Research question three

The third research question addressed the moderating potential of self-control in decomposing the relationship between exposure to violence and subsequent general offending. This study found evidence that self-control did indeed moderate the effect of exposure to violence. That is, even at high levels of exposure to violence, self-control appeared to buffer this effect. The major theoretical implications are discussed in depth

below, but in short it appears that the effect of environmental factors such as exposure to violence may change contingent on internal factors such as self-control.

Research question four

The fourth and final research question addressed whether or not self-control moderated the effect of exposure to violence on violent offending. Similar to general offending, self-control did appear to buffer the effect of exposure to violence on violent offending. While exposure to violence was a significant predictor of general and violent offending, its effects were moderated by self-control. This finding further confirms the assumption that exposure to violence leads to violent offending, but also finds the influence of other factors such as self-control may buffer the effect of exposure to violence.

Implications for theory

The results of this dissertation contribute to theory by providing empirical evidence in regards to how the impact of exposure to violence may lead to antisocial behavior. This dissertation provides evidence which suggests that the impact of environmental factors such as exposure to violence may be change based on internalized factors such as self-control. This finding continues the lineage of research started by Wright and colleagues (2001) who proposed that prosocial ties can deter antisocial behavior, especially among at risk individuals. Pertinent to the current study, not being exposed to violence is a protective effect and this protective effect is amplified among those who have higher self-control. In this scenario, an individual with greater self-control would exhibit some aspect of a “social-protection” effect from

environmental factors. Discovered in this dissertation is that individuals with greater levels of self-control appear to be less susceptible to the negative impacts of exposure to violence. Given the prevalence of exposure to violence in at-risk populations, practitioners may consider this effect when developing treatment or contingency plans for these more crime prone individuals (whether in treatment or incarcerated) who have histories of exposure to violence and/or low levels of self-control. Conversely, low self-control may contribute to antisocial ties which may promote antisocial behavior, especially among individuals who may have a predisposition to antisocial behavior due to environmental factors. This condition is referred to as the “social-amplification” effect. Similarly, both exposure to violence and low self-control should be addressed by practitioners developing treatment or alternative plans for individuals exhibiting these factors.

From a mainstream theoretical standpoint, the findings of this study supports the idea that criminal offending is a complex behavior and a multi-faceted theoretical approach is necessary to fully explain this phenomenon. As a standalone criminological theory, self-control fails to take into account environmental factors – with the exception of opportunity – which may contribute to one’s behavior. Specifically, this dissertation found that exposure to violence is as much an influential factor when predicting offending as is self-control. Self-control similarly in and of itself appeared to predict a significant proportion of the variance in both general offending as well as violent offending. Both, internalized and environmental factors should be included in any attempt to fully explain criminal behavior. There have been various attempts at theory

integration which merge the impact of environmental factors and internal factors. For example, social learning and self-control synergistic theory proposed by Jennings and colleagues (2013) suggests merging self-control and social learning theory. In summary this theory suggests delinquent behaviors result from observed/conditioned behavior but the impacts of this learning-process also affects or is affected by internal factors such as self-control. This dissertation provides support for the argument that further theory development and integration is needed to full explain the complex nature of human behavior. Moreover, this dissertation recommends that theories which advocate that sole environmental factors are major contributor to delinquency should consider the impact of internalized traits.

Implications for practice

Another impact of this dissertation which was mentioned briefly in the introduction is the fact that people of color are more likely to be exposed to environments which yield negative behavioral outcomes. This inequality should be acknowledged, then a plan developed, and steps taken to reduce the impact of these negative situations on this vulnerable population. To address these situations at the macro-level, policy makers should introduce policy which could mend factors leading to socioeconomic inequality. Solving the socioeconomic problems in the United States are certainly outside the scope of this dissertation, but it is duly acknowledged as a policy implication. Continuing, there are factors at the individual level which could be addressed by directed treatment programs. The first step would be to focus on individuals who are more susceptible to the effects of exposure to violence. These

individuals, in accord with this dissertation, would be those who exhibit negative personality traits such as low self-control. Although it is heavily debated throughout the criminological literature whether or not self-control changes over the life course, there are several techniques such as improving life skills or creating pro-social ties which may at least alleviate the negative effect of low self-control.

An example of these programs are those that follow the RNR (risk, need, and responsivity) model of rehabilitation. This intervention model contends that the reduction of an offender's involvement in crime will not only benefit the offender, but the community as well. They propose that an effective intervention revolves around compassionate, collaborative and dignified intervention which is targeted at factors known to promote criminal behavior (i.e., it is known as a risk reduction model). Furthermore, more crime can be prevented by targeting those individuals who are deemed to be at a higher risk. Therefore, an individual's risk level should be assessed prior to implementation of the intervention (Andrews, Bonta et al., 1990). In the RMR model there are several factors utilized when assessing an individual's risk level (e.g., anti-social attitudes, anti-social associates, anti-social temperament/personality, a static factor: a history of diverse anti-social behavior, family/marital circumstances, social/work, leisure/recreation, and substance abuse). The results of the current study suggests that environmental factors such as exposure to violence and internalized factors such as self-control could also be considered in assessing one's level of being at-risk. These individualized and focused models may provide improved and more successful intervention strategies.

In summary, exposure to violence does not only increase the risk of offending, but also interacts with other internalized factors such as self-control. Although the study was limited to the effects of self-control and exposure to violence, it is acknowledged that there are numerous other factors which could potentially impact the relationship that exposure to violence has on antisocial behavior. Furthermore, more research is needed to identify factors which develop prosocial ties could also contribute to the relationship between exposure to violence and subsequent offending. Finally employing intervention strategies that first identify those who are more at-risk for antisocial behavior may prove to be more successful and have the most impact.

Limitations

There are several limitations of this study worth acknowledging. The first has to do with the generalizability of the findings. The current study utilized a sample of youths convicted of violent offenses. There are some advantages to utilizing a sample of this nature, such as increased propensity for antisocial behavior, but these findings may not be generalizable to the greater population. In turn, the findings of this study are useful in identifying factors which lead to criminality in a high crime prone population. Therefore, this could also be considered one of the strengths of the present study. Individuals from an offender sample will generally experience significantly higher levels of exposure to violence. Thus, this type of sample allows for the calculation of reliable estimates regarding the effect of environmental factors.

Another strength of this study is that it utilizes a relatively large sample and a longitudinal design with fairly good participant retention. These three attributes allow

the estimation of complex statistical models accurately and with some degree of confidence regarding the results. Although Gottfredson and Hirschi (1990) proposed that one's level of self-control is stable over the life course which implies that longitudinal studies of self-control are not needed, stability studies of self-control have yielded varying results. Arneklev and colleagues (1999) measured the stability postulate of self-control in a sample of college students and found that self-control appeared to remain relatively stable but the time period they used was very short, only four months. Turner and Piquero (2002) also explored the stability hypothesis but their results were inconclusive. Other research finds that the stability of self-control is analogous to personality traits which remain relatively stable but can be changed over time (Johnson, McGue, and Krueger, 2005). Finally in a meta-analysis Pratt and Cullen (2000) found that self-control is related to offending both cross-sectionally and longitudinally. Therefore any abandonment of studying self-control at the longitudinal level may be premature considering the inconsistencies in the stability hypothesis.

Although employing data from an offender population may not necessarily generalize to the greater youth populous, there is little reason to suspect that offenders are vastly different from other youths. Specifically, there is little evidence to recommend that the impact of environmental factors and internalized factors on behavior are any different among youths. Therefore, the current sample consisted of individuals who may be exposed to higher levels of violence while professing lower levels of self-control.

Another noted limitation is that the pathways dataset consisted of a relatively small portion of females. Due to this limitation this dissertation is not very well suited to accurately estimate gender differences in the effect of self-control and exposure to violence on antisocial behavior. Alternatively, most criminological research finds that males are generally the most crime prone gender; thus, the current study encompasses the more at-risk group.

Furthermore, the sample employed in this study is also limited to adolescents which eliminates extending the effects of self-control and exposure to violence on subsequent offending to adults and younger children. Although this is a noted limitation, the majority of criminological research suggests that adolescents are responsible for the occurrence of more crime, in general. Therefore, this dissertation is focused on the more crime prone population.

Additionally, another limitation of the current study is that the measures are self-reported by the participants. Gottfredson and Hirschi's (1990) proposed that due to one's level of self-control responses to items measuring self-control attitudinally may be inaccurate. Since this proposition, several studies have successfully measured self-control attitudinally and found that these measures are consistent with measuring self-control behaviorally (Walters, 2015). In addition, when collecting sensitive information such as exposure to violence and victimization the results can be accurate if the interviewer is able to build a rapport with the participant and minimize discomfort (Tourangeau & Yan, 2007). Because of the techniques employed by the interviewers for the Pathways project it is reasonable to believe that the interviewers developed a rapport

with the participants which minimized embarrassment and increased the respondents honestly.

Furthermore, there is some debate as to how to measure self-control (see Longshore, Turner, & Stein, 1996; Tittle, Ward, & Grasmick, 2004). Some suggest it should be measured either behaviorally, attitudinally, or in some combination. Regardless of how self-control is measured the substantial conclusions of prior research have remained relatively consistent. The current study utilized an attitudinal measure consistent with prior research (Tittle et al., 2004). This measure of self-control contains the majority of the dimensions of self-control (impulse control, suppression of aggression, and consideration of others) as described by Grasmick and colleagues (1993), but does not measure for a predisposition for physical and less complicated tasks. Prior research offers little support for these excluded measures (Arneklev, Grasmick, & Bursik, 1999; Arneklev, Grasmick, Tittle, & Bursik, 1993). Utilizing attitudinal measures of self-control may be superior to behavioral measures because it avoids the tautological argument of predicting behavior based on similar behavioral measures. Furthermore, the measure utilized in the current study is derived from the FFM of personality. This multidimensional measure has been validated across various cultures, multiple methods, sources, and statistical techniques, etc. (see for example, Digman, 1990; John, 1990; Wiggins, 1996). While, at best, the utility of the Grasmick et al. scale is inconclusive (Longshore et al., 1996; Cochran et al., 1998; Piquero and Rosay, 1998; Arneklev et al., 1999; Piquero et al., 2000; Vazsonyi et al., 2001; Marcus, 2003).

One more noteworthy limitations of this study is related to the measures. First, the items in the initial offending measure “having killed someone” and “having forced sex” were both excluded from the offending scale due to confidentiality concerns. The extreme nature of these two factors suggest that self-reported offending may be underreported. Future studies addressing similar topics should, if possible, compile complete data on the offending measure. With that said, rare events like rape and murder are likely to have a very low base rate relative to other crimes (such as larceny and substance use). For example, in the United States it is estimated that there were 800 homicides which involved a juvenile perpetrator in 2010, while there were more than 280,000 cases for larceny and over 170,000 for drug abuse (Office of Juvenile Justice Delinquency Prevention, OJJDP, 2014). Rape is also (and fortunately) very rare (National Crime Victimization Survey, NCVS, 2014). Therefore, although there is inevitably some degree of underreporting, it is not likely to be so large that the findings would substantively change.

Another limitation of these data has to do with the exposure to violence measure. In the publicly available pathways data, the exposure to violence measure was already compiled into composite scores rather than individual items. Although this measure is commonly used to study violence and victimization it does not allow for the differentiation between situations in which the participant was actively involved in the violent incident or if he or she just observed the violent incident. The impact of being involved directly may be stronger than those of just bystanders (Monahan et al., 2015). Furthermore this limitation made it impossible to exclude theoretically irrelevant items

and isolate factors such as witnessing extreme violence. Future studies should consider looking at the impact of these factors separately because theoretically some factors, such as exposure to domestic abuse, may be more or less impacted by the buffering of level of self-control. That being said, this scale captures the overall frequency of exposure to violent events and has been utilized in a similar manner in several studies since it was developed (Monahan et al., 2015).

Conclusion

Regardless of these limitations, this study offers a substantive contribution to the literature by exploring internalized factors which may impact the effects of environmental factors. One first important finding was that self-control negatively related to offending. That is, individuals with greater self-control were less likely to engage in both violent and general offending. Although this is not a novel finding in and of itself, this link has not been demonstrated in offender samples as often as non-offender samples.

The current study was limited to an offender sample which makes it likely that this sample has a restricted range of self-control. That is, the offender sample is more likely to have a greater amount of individuals with low self-control. In spite of this, a relationship was found between self-control and antisocial behavior. Other studies are commonly based on student samples (for examples see Pratt & Cullen, 2000) and these studies suffer from the same problem but in the opposite direction. These studies largely include mostly individuals with greater levels of self-control. One fact that stands out is that in many of these samples even with some restriction in range, a

relationship between self-control and antisocial behavior is observed. This consistency speaks favorably to the robustness of the self-control and offending relationship.

Innately this dissertation helps to identify characteristics that may contribute to an individual's risk of antisocial behavior. Specifically, reducing exposure to violence and increasing one's level of self-control could ultimately reduce antisocial behavior. These findings can be utilized to guide treatments and interventions, which should be more focused on those individuals who may be at a greater risk for criminal offending. The identification of these individuals who may be more at-risk is important due to the scarcity of resources, specifically in treatment programs directed at offenders. The current research positions practitioners to be better suited to determine which individuals may be more at risk for antisocial behavior. Furthermore, practitioners should focus the majority of their limited resources to address those individuals who are at a greater risk (Bonta & Andrews, 2007).

Future research should further explore nonlinear effects between exposure to violence and self-control on offending. Some researchers suggest the relationship between various external and internal factors which relate to human behavior does so in a nonlinear manner. It appears to be the default mindset in criminological research that these relationships are linear. That is, for every increase in the predictor variable, the dependent variable also increases/decreases in an expected manner. Possibly in some situations, factors that lead to antisocial behavior may do so in this linear fashion. Recent studies suggest that this may not be the case, especially so when analyzing variables like self-control (Mears, Cochran, & Beaver, 2013). It is quite possible that

larger values of the predictor variable may have a larger impact on the dependent variable. Conversely, low levels of the predictor variable may have little to no impact on the dependent variable. In situations like this there may be some threshold that the predictor variable must reach before there is any impact on the dependent variable. For example, in the current study low levels of exposure to violence may have little to no impact on self-reported offending. As this level of exposure to violence increases it may have more of a substantial impact on the dependent variable. Similarly, moderate levels of self-control may not impact an outcome variable of antisocial behavior as much as higher or lower levels. Understanding these nonlinear relationships is important to completely comprehend a behavioral phenomenon. Although many theorists have discussed the importance of understanding these nonlinear relationships (see Merton 1945; Sorensen 2009) few researchers have dabbled in integrating these relationships into theory. One possible reason for the lack of acknowledgment is to Occam's razor, which suggests that the simplest explanation is the best explanation. Unfortunately when dealing with the complex nature of human behavior, the simplest explanation may not always be the best or most encompassing explanation (Mears, Cochran, & Beaver, 2013). This simple presumption may limit criminological research which is founded on linear theories which promote linear research and may not be an actual depiction of how human behavior functions (see, e.g., Abbott 1988; Guion 1998; Whitmeyer 2009; see also Agnew 2005). Future research should continue to unpack these nonlinear relationships.

Furthermore, continuing research could address a possible relationship between the effects of self-control on situational factors such as neighborhood condition. It appears plausible that an individual who exhibits low self-control but resides in a more desirable area may be less likely to act on their delinquent predisposition. Conversely, those with greater levels of self-control by who reside in poorer conditions may be at a higher risk for delinquent behavior. This relationship between environment and internalized factors may change based on specific living conditions. As living conditions change there may be some variability in one's susceptibility to the consequences self-control level.

In short, the study looked at how the internalized factor self-control impacted the effect of an environmental factor, exposure to violence. Both of these factors independently predicted antisocial behavior, but more interesting was how these factors interacted. One's level of self-control appeared to reduce the impact of exposure to violence. This proposes that self-control moderates the effect of exposure to violence. Future research should be devised to explore other factors which may influence the impact of environmental factors.

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APPENDICES

Appendix A. Interaction of Exposure to Violence and Self-control on General Offending with Maximum likelihood Estimation for Missing Values and Time in Street.

	General Offending	
	Coefficient	SE
Exposure to Violence	0.6129***	0.17
Low Self-Control	0.3164**	0.11
Exposure to Violence X Self-Control	0.0368*	0.02
Delinquent Peers	0.7287***	0.16
Neighborhood	-0.1668	0.16
Male	1.1155**	0.35
Black	-1.0918***	0.30
Hispanic	-0.8950**	0.30
Age	-0.3856***	0.10
Time in Street	-2.5124***	0.59

* p<.05 ** p<.01 *** p<.001

Appendix B. Interaction of Exposure to Violence and Self-control on Violent Offending with Maximum likelihood Estimation for Missing Values and Time in Street.

	Violent Offending	
	Coefficient	SE
Exposure to Violence	0.3560***	0.08
Low Self-Control	0.0906 ⁺	0.05
Exposure to Violence X Self-Control	0.0214**	0.01
Delinquent Peers	0.2680***	0.07
Neighborhood	-0.0672	0.07
Male	0.7048***	0.16
Black	-0.0793	0.14
Hispanic	-0.1727	0.14
Age	-0.2171***	0.05
Time in Street	-1.2214***	0.26

* p<.05 ** p<.01 *** p<.001

Appendix C. Interaction of Exposure to Violence and Self-control on General Offending with Maximum likelihood Estimation for Missing Values without Time in Street.

	General Offending	
	Coefficient	SE
Exposure to Violence	0.6710***	0.17
Low Self-Control	0.3018**	0.11
Exposure to Violence X Self-Control	0.0395*	0.02
Delinquent Peers	0.8540***	0.16
Neighborhood	-0.1218	0.16
Male	1.6959***	0.33
Black	-0.9724**	0.30
Hispanic	-0.8184**	0.30
Age	-0.3892***	0.10

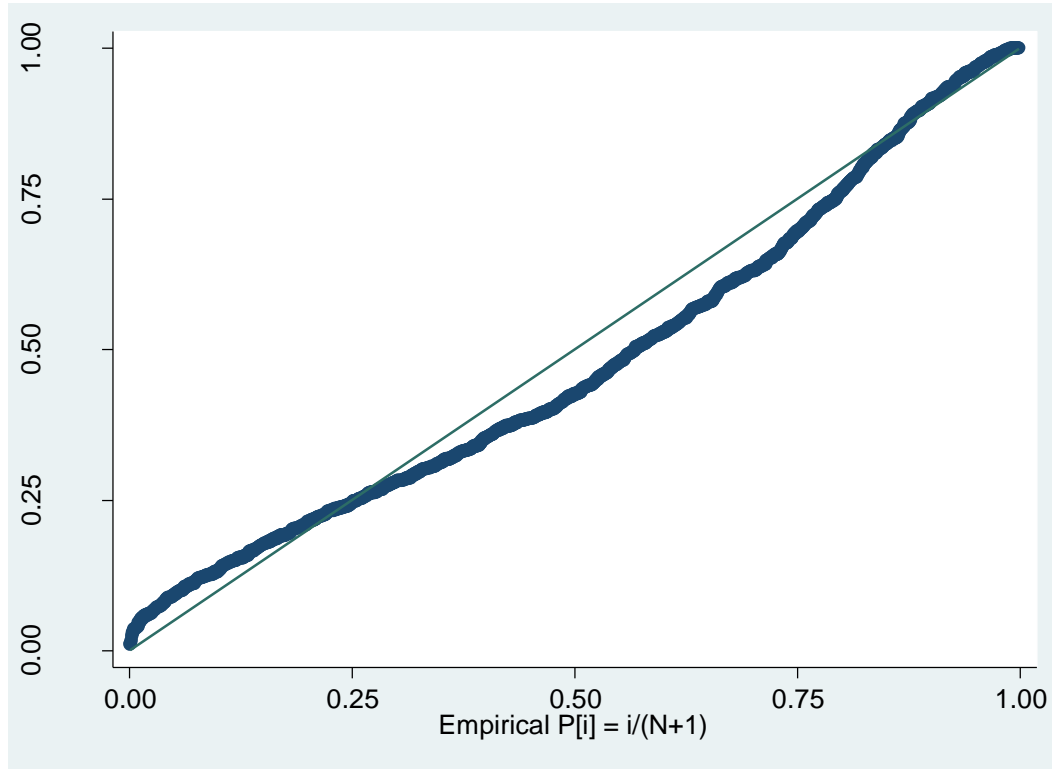
* p<.05 ** p<.01 *** p<.001

Appendix D. Interaction of Exposure to Violence and Self-control on Violent Offending with Maximum likelihood Estimation for Missing Values without Time in Street.

	Violent Offending	
	Coefficient	SE
Exposure to Violence	0.3842***	0.08
Low Self-Control	0.0839	0.05
Exposure to Violence X Self-Control	0.0227**	0.01
Delinquent Peers	0.3296***	0.07
Neighborhood	-0.0465	0.07
Male	0.9881***	0.15
Black	-0.0189	0.14
Hispanic	-0.1361	0.14
Age	-0.2187***	0.05

*p<.05 ** p<.01 *** p<.001

Appendix E: Standard Normal Probability Plot
 (Assesses normality especially in the middle of the distribution)



Appendix F. Interaction of Exposure to Violence and Self-control on General Offending Using Zero-Inflated Negative Binomial Regression.

	General Offending	
	Coefficient	SE
Exposure to Violence	0.0470***	0.01
Low Self-Control	0.0814***	0.01
Exposure to Violence X Self-Control	0.0024	0.00
Delinquent Peers	0.1301***	0.03
Neighborhood	-0.0215	0.03
Male	0.2843***	0.06
Black	-0.1555**	0.05
Hispanic	-0.1023*	0.05
Age	-0.0514**	0.02

* p<.05 ** p<.01 *** p<.001

Appendix G. Interaction of Exposure to Violence and Self-control on Violent Offending Using Zero-Inflated Negative Binomial Regression.

	Violent Offending	
	Coefficient	SE
Exposure to Violence	0.0563***	0.01
Low Self-Control	0.0576***	0.01
Exposure to Violence X Self-Control	0.0016	0.00
Delinquent Peers	0.0920***	0.03
Neighborhood	-0.0131	0.03
Male	0.3603***	0.07
Black	-0.0042	0.05
Hispanic	-0.0331	0.05
Age	-0.0482**	0.02

* p<.05 ** p<.01 *** p<.001